# Industrial QUALITY CONTROL

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QUALITY
through
Scientific Methods

1946—TENTH ANNIVERSARY YEAR—1956

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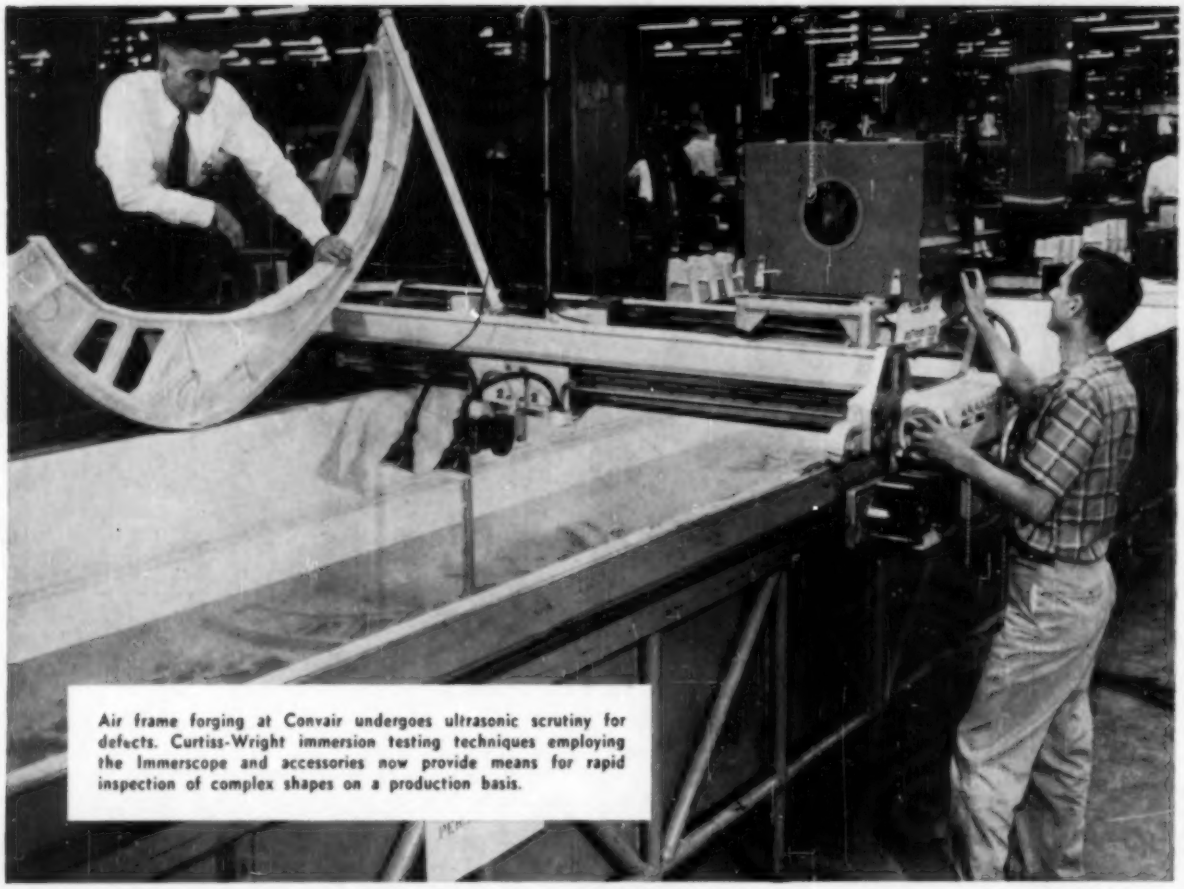

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# Quality Control

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# *From the President's Desk*

## The Annual Decision

"Which one?," you might appropriately ask, since most of us are faced with several. Taxes? Christmas? Anniversaries? Where to go on vacation? What?

This one is about renewing membership with ASQC. It is automatic for me these days—no problem in deciding. In my work, I can't afford NOT to be a member. But arriving at this decision was not always so simple.

In these comments let me remove myself from the officer classification, since in that status I would naturally be expected to give a sales pitch in favor of holding ASQC membership. Let me just talk as another individual who makes his living by working with Quality Control techniques.

This IS that time of year when we are asked to pay our dues for another twelve months. In years past, each time this came up I found myself considering three aspects of the question. The first was strictly personal. Would I get my money's worth? This could be either in terms of added knowledge through which I became more impo tant to my company, or it could be a direct gift in the form of problem solutions which would make my job easier.

Then there was that part of the question which implied industrial representation—in my case, identifying myself with the growth of SQC techniques in the air transportation business.

Thirdly, and believe me, this had (and has) a strong appeal, there is the satisfaction of making myself a part of a general industrial advance through SQC.

The record shows clearly the nature of my decisions. Always I found that membership with the American Society for Quality Control had more to offer than I could afford to turn down. There were no two ways about it—if Quality Control was to be my work, I *belonged* in the Society.

It seems to me that the three aspects of this question, when seriously considered, leave little choice for one but to sign up again just as soon as his membership expires.

Actually, paying the dues is the minor part of renewing. The important thing is to PARTICIPATE! Help this Society to help you. Do it on a local, a regional, or on a national basis; but whatever it is, *participate!*

Paying your dues early will, of course, help the Society's officers to better plan improved service to you. The simplest expedient for better service, however, is to aid in building the Society to a size which will enable us to REALLY do things for the members.

It is a a time-worn gimmick, but one yet to be disproved: IF EACH OF US RENEWS PROMPTLY AND BRINGS IN ONE NEW MEMBER, WE ARE MADE. Simple, isn't it?

You want to do something for yourself? Do that.

The founding members of this Society designed well for your interest and mine. We are just now at that stage of development where we should really begin to offer first-class service to the membership. Division activities to help individuals specialize, uniform education and training practices for use at local level, increased student branch activity, a better magazine, more and better local and regional meetings—these and many other plans for the benefit of our members are about to be realized.

But YOU are the key. YOU ARE the Society. Why not decide to get more out of Quality Control work for yourself. Renew early and bring someone with you as you make this "Annual Decision."

DALE L. LOBSINGER

# Fundamentals of Analysis of Variance

CHARLES R. HICKS

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## Part II—The Components of Variance Model and the Mixed Model

*Ed. note. This is the second in a series of three articles on the fundamentals of analysis of variance. Part I appeared in the August issue, p. 17-20.*

The setting up of a mathematical model and the determination of the Sums of Squares in the analysis of variance was emphasized in Part I. After the analysis, an F test was used to determine whether or not a particular factor in the model was present depending on how the variance estimate (M.S.) due to this factor compared in size with the estimate of error variance. Thus hypotheses on means were tested by a variance ratio or F test. In some experiments it is also of interest to estimate the components of variance or the amount of the total variance which might be attributable to the various factors in the model. However, one should only consider those factors which the F test has shown to have a significant effect on the measured variable.

In Part I, care was taken to discuss only fixed levels of a factor in the models. That is, the categories or levels of a given factor were considered the only ones of interest, whereas in practice some levels are often chosen at random from a large number of possible levels. When this is the case, the factor is said to be a random factor and a model based on such factors only is called a random model.

In industrial experimentation, some factors such as operators, days etc. might very well be considered in this way. The levels chosen, i.e. the particular operators, days etc. are but a random sample of a large number of levels that might have been chosen. Some statisticians feel that in these random models, one is chiefly interested in estimating the component of variance due to the given factor rather than in testing hypotheses on the equality of the mean values of the specific levels chosen. Thus, the random model has often been called the "Components of Variance" model and a model with all fixed levels of a factor the "Analysis of Variance" model[3].

**TABLE I—Data and ANOVA for Tube Brightness Problem**

| | | Phosphor Type | | | |
|---|---|---|---|---|---|
| | | A | B | C | |
| Glass Type | I | 280<br>290<br>285 | 300<br>310<br>295 | 270<br>285<br>290 | $X_{ijk}$ = Current in microamps. |
| | II | 230<br>235<br>240 | 260<br>240<br>235 | 220<br>225<br>230 | |

| Source | df | SS | MS | Expected Mean Square | |
|---|---|---|---|---|---|
| Total | 17 | 618.44 | | | |
| Between Glass | 1 | 533.55 | 533.55 | $\sigma_e^2 + 9\sigma_G^2$ | (1) |
| Among Phosphors | 2 | 49.77 | 24.88 | $\sigma_e^2 + 6\sigma_P^2$ | (2) |
| G × P Interaction | 2 | 1.78 | 0.89 | $\sigma_e^2 + 3\sigma_{GP}^2$ | (3) |
| Error | 12 | 33.34 | 2.78 | $\sigma_e^2$ | (4) |

Some authors even use different notation for the variance component for fixed levels and for random levels. In this discussion, the notation will be the same, but the distinction between the random and fixed levels will be made when the model is presented.

To get some idea of the importance of these components of variance, let us consider a problem in which the experimenter wished to study the effect of glass type and phosphor type on the brightness of a TV tube screen. The measured variable in this case was the current in microamperes necessary to produce a certain brightness: the larger this current the poorer the tube screen characteristics. The experimenter had only two glass types of interest and only three phosphor types. Thus, the factors were each at fixed levels and the model is similar to the problem considered in Part I. The model here is:

$$X_{ijk} = \overline{X}' + G'_i + P'_j + (GP)'_{ij} + \varepsilon'_{k(ij)}$$

where $\overline{X}'$ is the common effect

$G'_i$ is the glass type effect and $i = 1, 2$ only.

$P'_j$ is the phosphor type effect and $j = 1, 2, 3$ only.

$(GP)'_{ij}$ is the interaction which is possible between glass and phosphor types.

$\varepsilon'_{k(ij)}$ is the random error and $k = 1, 2, 3$ as it was decided to run three repeats of the experiment under the same conditions. The notation $k(ij)$ simply means k different readings within, or nested in, each ij cell. The variance of these three gives an estimate of the variance of random errors.

The data and analysis of variance (ANOVA) are shown in Table I.

The analysis was actually run on coded data where 260 was subtracted from each observation and the result divided by five. Here both factors were considered fixed and a new column has been added to the ANOVA table called the "Expected Mean Square." Some refer to this as the 'components of variance' column and it is probably the most important part of the table. The symbols in this column are derived mathematically as the mean square to be expected if the model is correct. As their derivation is somewhat involved, it is our purpose to develop an easy method for a quick determination of these terms. For this problem, let us assume that the entries are correct, and see just what use can be made of the Expected Mean Square (EMS) column. There are two important uses to be made of this EMS column:

- To decide what F tests to run in the ANOVA.
- To estimate the components of variance due to each significant term in the model.

In Part I all F tests were performed by comparing the MS line of interest with the MS in the error line of the

table. For a completely fixed model all effects are tested against the error MS or the error line [line (4) in Table I]. From the EMS column, it is clear that this should be so, as for example, to test the hypothesis that the glass type means $\overline{G'}_1$ and $\overline{G'}_2$ are equal is the same as testing whether or not the variance of these is zero or $\sigma_G^2 = 0$. If one assumes the hypothesis true; i.e., assumes $\sigma_G^2 = 0$, the ratio of line (1) to line (4) would be $\frac{\sigma_e^2}{\sigma_e^2}$ or 1. The departure from unity, being due only to chance, is checked by the F table for the degrees of freedom which apply. If, however, $\sigma_G^2$ is not zero, but the glass types really do effect the current, as they do here, this ratio $\frac{\sigma_e^2 + 9\ \sigma_G^2}{\sigma_e^2}$ should depart significantly from unity and it is reasonable to conclude that $\sigma_G^2$ is not zero so that glass type effect is real. In a similar manner, it is noted that all effects in this fixed model should be tested against line (4), the error line, to check the hypotheses that $\sigma_P^2 = 0$ and $\sigma_{GP}^2 = 0$. All this may seem very obvious to those who always test main effects and interactions against the error MS but actually this procedure is only valid for a fixed model and it will be shown that in a random model these are not the correct tests to run. It is thus the EMS column which indicates which tests should be run for testing hypotheses.

If now the proper F tests have been run and the significant factors determined, how does one estimate the components of variance? First, any variance component such as $\sigma_{GP}^2$ above which is not significant is eliminated (set = 0) in the EMS column. Then the observed MS values are best estimates of these terms in the EMS column. Setting the MS terms equal to the significant EMS terms, one may solve for the variance components of interest. In the example, glass type and phosphor type were both very significant but the interaction was not. Set up the equalities:

$$533.55 = \sigma_e^2 + 9\ \sigma_G^2$$

$$24.88 = \sigma_e^2 + 6\ \sigma_P^2$$

$$2.78 = \sigma_e^2$$

Thus, the best estimate of the error variance is 2.78 coded or $(25)(2.78) = 69.5$ in $(\mu a)^2$. Substituting in the 1st expression:

$$533.55 = 2.78 + 9\sigma_G^2$$

or

$$9\ \sigma_G^2 = 530.77$$

$$\sigma_G^2 = 58.77 \quad [\text{or } 1474.3(\mu a)^2]$$

and substituting in the 2nd:

$$24.88 = 2.78 + 6\ \sigma_P^2$$

$$6\ \sigma_P^2 = 22.10$$

$$\sigma_P^2 = 3.68 \quad [\text{or } 92.0(\mu a)^2]$$

The estimate of total variance then due to all these sources is (in original units): $69.5 + 1474.3 + 92 = 1635.8$ of which $\left(\frac{1474.3}{1635.8}\right)$, or 90.1 percent, is attributable to glass types, $\left(\frac{92}{1635.8}\right)$, or 5.6 percent, to phosphor types and $\left(\frac{69.5}{1635.8}\right)$, or 4.3 percent, to error. Even though the phosphor type contributes only 5.6 percent of the variance, it cannot be ignored as it has already been shown to be significant. It is obvious, however, that the glass type is the major source of variation.

Returning to the EMS column, it is seen that it provides the clue for what tests to run as well as how to estimate the components of variance due to the various sources in the model. If a model contains some random factors and some fixed factors, it is called a mixed model. Many industrial experiments are of this type, where one factor may be operators, and interest lies not in these particular operators but only in variation among operators of which the ones used are but a random sample. Now the decision as to whether a factor is at fixed or random levels is a practical one and not up to the statistician. If the experimenter considers operators as a random factor and wishes to generalize the results of his experiment beyond the few operators he chose, he must take measures to assure that the operators are really chosen at random from a large number of possible operators. If, in the example of Tables IV-V in Part I, operators are considered as randomly chosen and the nozzle types as fixed, the model is now a mixed model and the resulting analysis would be:

**TABLE II—ANOVA for Nozzle, Operator Mixed Model Data**

| Source of Variation | df | SS | MS | EMS | |
|---|---|---|---|---|---|
| Total | 44 | 7085.24 | | | |
| Among Nozzles | 2 | 1426.97 | 713.49 | $\sigma_e^2 + 3\ \sigma_{NO}^2 + 15\ \sigma_N^2$ | (1) |
| Among Operators | 4 | 798.79 | 199.70 | $\sigma_e^2 + 9\ \sigma_O^2$ | (2) |
| N × O Interaction | 8 | 1821.48 | 227.68 | $\sigma_e^2 + 3\ \sigma_{NO}^2$ | (3) |
| Error | 30 | 3038.00 | 101.27 | $\sigma_e^2$ | (4) |

From the EMS column it is seen that in order to test the hypothesis of no nozzle effect, or $\sigma_N^2 = 0$, the proper F test is to compare line (1) with line (3) instead of line (4)—the error line. A significant ratio here would indicate that the nozzle types did affect the rate of flow, whereas if line (1) is compared to the error line, it would not be clear whether the nozzle type or its interaction with operators, or both, produced the significant effect. The effect of operators and interaction is seen to be tested by the error line as in a fixed model. The decision then as to which tests to make after computing the MS column depends on what assumptions are made in the model as to which factors are at fixed levels and which at random levels.

The crux of the problem is then to derive these EMS values from the model for a given experiment. This would be a bi[illegible]edious if the mathematical derivation had to be carried out for every experiment. Some work on finite models by Cornfield[4] presented at the American Statistical Association meeting in Washington in 1953 and a more general formulation in a recent text by Bennett and Franklin[5] can be used to develop a set of rules for determining the EMS values. If one assumes that the levels of a factor, if random, are chosen from a large number (infinite) of possible levels these rules derived for a finite model can be applied here.

These rules are given below and are applied here to the foregoing problem:

1. Write the variable terms in the model as row headings in a two-way table.
2. Write the subscripts involved in the model as column headings. Indicate by F or R which subscripts correspond to fixed levels of a factor and which to random levels.

| Ex. | F<br>i | R<br>j | R<br>k | [Errors are always random]. |
|---|---|---|---|---|
| $N_i$ | | | | |
| $O_j$ | | | | |
| $(NO)_{ij}$ | | | | |
| $\varepsilon_{k(ij)}$ | | | | |

3. For each row (each term in the model), when a subscript letter is missing in the subscript of the row heading, copy in the table the number of observations under the corresponding column heading.

| Ex. | i | j | k | |
|---|---|---|---|---|
| $N_i$ | | 5 | 3 | As: i = 1,2,3 nozzle types |
| $O_j$ | 3 | | 3 | j = 1,2,...,5 operators |
| $(NO)_{ij}$ | | | 3 | k = 1,2,3 observations per cell. |
| $\varepsilon_{k(ij)}$ | | | | |

4. For any subscript letter in the model which is in brackets [e.g. i and j in $\varepsilon_{k(ij)}$] place a 1 under the corresponding column heading. [e.g. under i and j here]:

| | i | j | k |
|---|---|---|---|
| $N_i$ | | 5 | 3 |
| $O_j$ | 3 | | 3 |
| $(NO)_{ij}$ | | | 3 |
| $\varepsilon_{k(ij)}$ | 1 | 1 | |

5. Fill in the remaining cells with a 0 or a 1 depending upon whether the subscript represents a fixed or random factor.

| | F<br>i | R<br>j | R<br>k |
|---|---|---|---|
| $N_i$ | 0 | 5 | 3 |
| $O_j$ | 3 | 1 | 3 |
| $(NO)_{ij}$ | 0 | 1 | 3 |
| $\varepsilon_{k(ij)}$ | 1 | 1 | 1 |

6. To find the EMS for any term in the model:
Cover the entries in the column (or columns) which contain non-bracketed subscript letters in this term in the model. (e.g. for $N_i$: cover column i; for $\varepsilon_{k(ij)}$ cover column k etc.)

Multiply the remaining numbers in each row if their row heading (term in model) contains the subscript letter(s) of the term in question (e.g. for $N_i$: $5 \times 3$, $1 \times 3$, $1 \times 1$—not another $1 \times 3$, as $O_j$ does not carry the subscript letter i in $N_i$).

These numbers (e.g. 15, 3, 1) now become coefficients of the corresponding variance terms in the EMS column.

| | F<br>i | R<br>j | R<br>k | EMS |
|---|---|---|---|---|
| $N_i$ | 0 | 5 | 3 | $\sigma_e^2 + 3\,\sigma_{NO}^2 + 15\,\sigma_N^2$ |
| $O_j$ | 3 | 1 | 3 | $\sigma_e^2 + 9\,\sigma_O^2$ |
| $(NO)_{ij}$ | 0 | 1 | 3 | $\sigma_e^2 + 3\,\sigma_{NO}^2$ |
| $\varepsilon_{k(ij)}$ | 1 | 1 | 1 | $\sigma_e^2$ |

e.g. for the EMS of 1st line—cover column i as i appears in N. This leaves:

| | ~~i~~ | j | k |
|---|---|---|---|
| $N_i$ | ~~0~~ | 5 | 3 |
| $O_j$ | ~~3~~ | 1 | 3 |
| $(NO)_{ij}$ | ~~0~~ | 1 | 3 |
| $\varepsilon_{k(ij)}$ | ~~1~~ | 1 | 1 |

The product of the numbers left provide the coefficients for the corresponding variance components if we use only those containing i in the term of the model. Here these products are 15, 3, 1 (omitting the 3 at $O_j$ as there is no i in $O_j$). These numbers are then the coefficients of $\sigma_N^2$, $\sigma_{NO}^2$, and $\sigma_e^2$ respectively for the nozzle type EMS line.

The proper tests to run are usually quite obvious from this EMS column. There is no necessity to assume anything about interaction before one tests any main effect because the F test follows whether the interaction term is significant or not.

Consider a second example in which an industrial engineering student wished to determine the effect of five different clearances of mating parts on the time required to position and assemble the part. As all such experiments involve operators, it is natural to consider operators as another important factor in the time required for executing these simple therbligs (elementary motion units). The measured variable here is the time required for position and assembly of the part and the experimenter also felt that whether the part was assembled directly in front of the operator or at arms length from the operator might influence this assembly time. He also wished to try four different angles in his set up from zero degrees directly in front of the operator thru 30, 60 and 90 degrees from this position. As all possible angles could be combined with both positions and all clearances and this arrangement tried by all operators, his was a factorial experiment where every level of each of four factors was combined with every other level of these factors. The experimenter also repeated the same set-up six times with every operator.

From this information, we see that there are four main effects: Operators ($O_i$) where he chose six operators at random, angles ($A_j$) chosen as fixed at 0, 30, 60 and 90 degrees, clearances ($C_k$) chosen at five fixed values, and locations ($L_l$) either in front of the operator or at arms length. Also there might be any or all pos-

TABLE III—EMS Determination on Time Study Problem

| | df | R i | F j | F k | F l | R m | EMS |
|---|---|---|---|---|---|---|---|
| $O_i$ | 5 | 1 | 4 | 5 | 2 | 6 | $\sigma_e^2 + 240\ \sigma_O^2$ |
| $A_j$ | 3 | 6 | 0 | 5 | 2 | 6 | $\sigma_e^2 + 60\ \sigma_{OA}^2 + 360\ \sigma_A^2$ |
| $(OA)_{ij}$ | 15 | 1 | 0 | 5 | 2 | 6 | $\sigma_e^2 + 60\ \sigma_{OA}^2$ |
| $C_k$ | 4 | 6 | 4 | 0 | 2 | 6 | $\sigma_e^2 + 48\ \sigma_{OC}^2 + 288\ \sigma_C^2$ |
| $(OC)_{ik}$ | 29 | 1 | 4 | 0 | 2 | 6 | $\sigma_e^2 + 48\ \sigma_{OC}^2$ |
| $(AC)_{jk}$ | 12 | 6 | 0 | 0 | 2 | 6 | $\sigma_e^2 + 12\ \sigma_{OAC}^2 + 72\ \sigma_{AC}^2$ |
| $(OAC)_{ijk}$ | 60 | 1 | 0 | 0 | 2 | 6 | $\sigma_e^2 + 12\ \sigma_{OAC}^2$ |
| $L_l$ | 1 | 6 | 4 | 5 | 0 | 6 | $\sigma_e^2 + 120\ \sigma_{OL}^2 + 720\ \sigma_L^2$ |
| $(OL)_{il}$ | 5 | 1 | 4 | 5 | 0 | 6 | $\sigma_e^2 + 120\ \sigma_{OL}^2$ |
| $(AL)_{jl}$ | 3 | 6 | 0 | 5 | 0 | 6 | $\sigma_e^2 + 30\ \sigma_{OAL}^2 + 180\ \sigma_{AL}^2$ |
| $(OAL)_{ijl}$ | 15 | 1 | 0 | 5 | 0 | 6 | $\sigma_e^2 + 30\ \sigma_{OAL}^2$ |
| $(CL)_{kl}$ | 4 | 6 | 4 | 0 | 0 | 6 | $\sigma_e^2 + 24\ \sigma_{OCL}^2 + 144\ \sigma_{CL}^2$ |
| $(OCL)_{ikl}$ | 20 | 1 | 4 | 0 | 0 | 6 | $\sigma_e^2 + 24\ \sigma_{OCL}^2$ |
| $(ACL)_{jkl}$ | 12 | 6 | 0 | 0 | 0 | 6 | $\sigma_e^2 + 6\ \sigma_{OACL}^2 + 36\ \sigma_{ACL}^2$ |
| $(OACL)_{ijkl}$ | 60 | 1 | 0 | 0 | 0 | 6 | $\sigma_e^2 + 6\ \sigma_{OACL}^2$ |
| $\varepsilon_{m(ijkl)}$ | 1200 | 1 | 1 | 1 | 1 | 1 | $\sigma_e^2$ |

sible interactions of these four factors. One can then write out the complete model as:

$$X_{ijklm} = \bar{X}' + O'_i + A'_j + (OA)'_{ij} + C'_k + (OC)'_{ik} + (AC)'_{jk} + (OAC)'_{ijk} + L'_l + (OL)'_{il} + (AL)'_{jl} + (OAL)'_{ijl} + (CL)'_{kl} + (OCL)'_{ikl} + (ACL)'_{jkl} + (OACL)'_{ijkl} + \varepsilon'_{m(ijkl)}$$

where $i = 1, 2 \ldots 6$ $k = 1, 2 \ldots 5$ $m = 1, 2 \ldots 6$

$j = 1, 2 \ldots 4$ $l = 1, 2$

Here operators were considered a random factor and all others were considered as fixed. Now we ask, "Just what tests can be made to check on the effect of angles, clearances, and locations on the assembly time and also how much of the variance might be due to operator differences which are almost certain to be found significant?" Also, "What interactions are important?"

Following the rules, we set down the model and determine the EMS column as in Table III.

From this EMS column it is easy to see what mean squares are to be compared to test any given hypotheses on either main effects or interactions. It is interesting to note that all fixed effects are tested by the term directly below them and all effects involving operators are tested by the error term.

These examples have shown the importance of the EMS line in an analysis of variance and how fixed and random models affect its determination.

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# Statistical Quality Control Will Work on Short-Run Jobs


HERSCHELL R. HARRISON

*Collins Radio Co., Cedar Rapids, Iowa*


This article will relate some of the experiences and benefits derived at Collins Radio Company from using statistical quality control. We hope they will prove beneficial to other plants that are not now using statistical quality control, and especially to those plants that are faced with short-run jobs.

Many of our orders at Collins are for quantities of 100 or less of very complex electrical equipment, so we are constantly confronted with machines and processes that will be changed from one part number to another part number many times during an 8-hr period. When we first attempted to apply control charts to such machines or processes, we were considerably discouraged because most of our charts were meaningless. Only one or two plottings would get on the chart and then the particular part number in question would be finished.

We were fortunate in having a close neighbor, the W. A. Sheaffer Pen Company, who gave us some very valuable assistance with this particular problem.

We then changed our procedure, and now, instead of running a control chart on each part number, we run a control chart on the process or machine itself. In other words, we record the number of pieces inspected and the number of defectives found each hour, regardless of part number, and record these data on a small data card. At the end of an 8-hr shift, the percent defective work produced by the machine or process is figured from the machine data card and plotted on a percent defective chart. Both data card and chart are prominently displayed over the machine at all times. The only part number record we keep is on our in-

spection data card that is turned in daily to the inspection foreman for future reference in case trouble is encountered with the parts. By having process control, regardless of the part number such processes may be producing, we feel our original quality objective has been accomplished.

For special studies or on longer run jobs that consistently fail to produce a part within the required quality goal, we many times resort to average and range charts. (See Fig. 1). We also use the average and range chart to determine machine or process capabilities.

Two very essential points to keep in mind on process control are:

1. Control the order of production so that each time the process is checked, the work previously approved is separated. If trouble is encountered, it is then necessary to screen no more than the amount of work produced from the last inspection, and then often for only one attribute.
2. Take corrective action. This can't be overemphasized! Charts are of little value if corrective action is not taken when the need for action is indicated by the control charts.

Another benefit from statistical quality control that we consider highly important is the ability to establish a quality goal in all departments.

We have a quality goal in all our fabrication sections of no worse than two percent defective work. Each week we summarize the data from all p charts and plot the percent defective work produced by each section for the week on a large 18 by 22 in. quality trend chart (see Fig. 2) which is displayed as close to each foreman's desk as possible. This chart reflects each foreman's quality results for the week in relation to his quality goal which is clearly defined by a green color band on the chart.

We have control charts on every machine or process in our fabrication departments that are maintained by the line or patrol inspectors who constantly patrol their specified areas. When a new job is started and the operator thinks he has a process or machine producing parts within specifications, the inspector in the area inspects the parts and if parts are within specifications, the job is started. The inspector then starts routine sampling of the job. Wherever possible, we make our inspection gages available to the operators, and they check their own work between the inspection intervals. Only the inspectors' results, however, are plotted on our control charts.

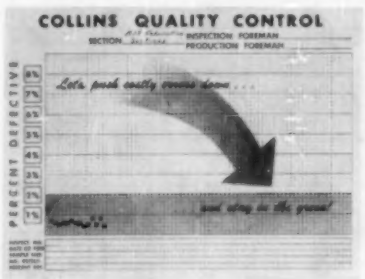

COLLINS QUALITY CONTROL
INSPECTION FOREMAN
PRODUCTION FOREMAN
PERCENT DEFECTIVE
Let's push costly errors down . . .
. . . and stay on the ground

Figure 2—Quality Trend Chart

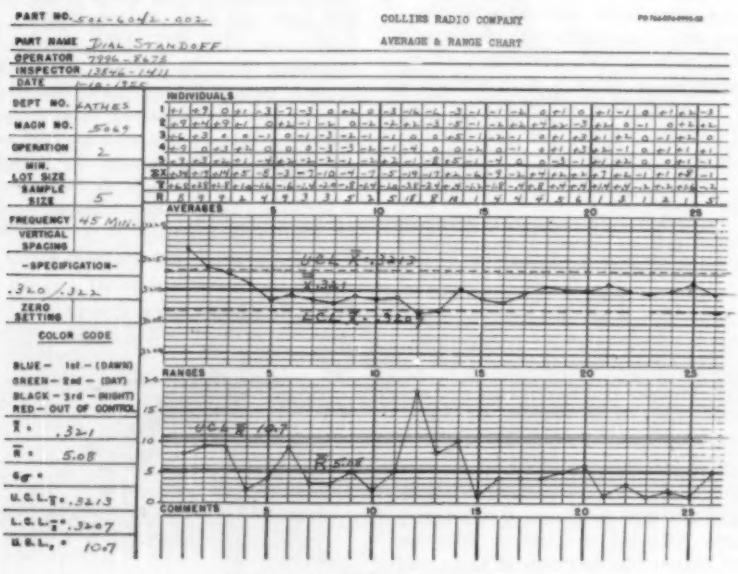



Figure 1—Average and Range Chart

Figure 3—Quality Control Model

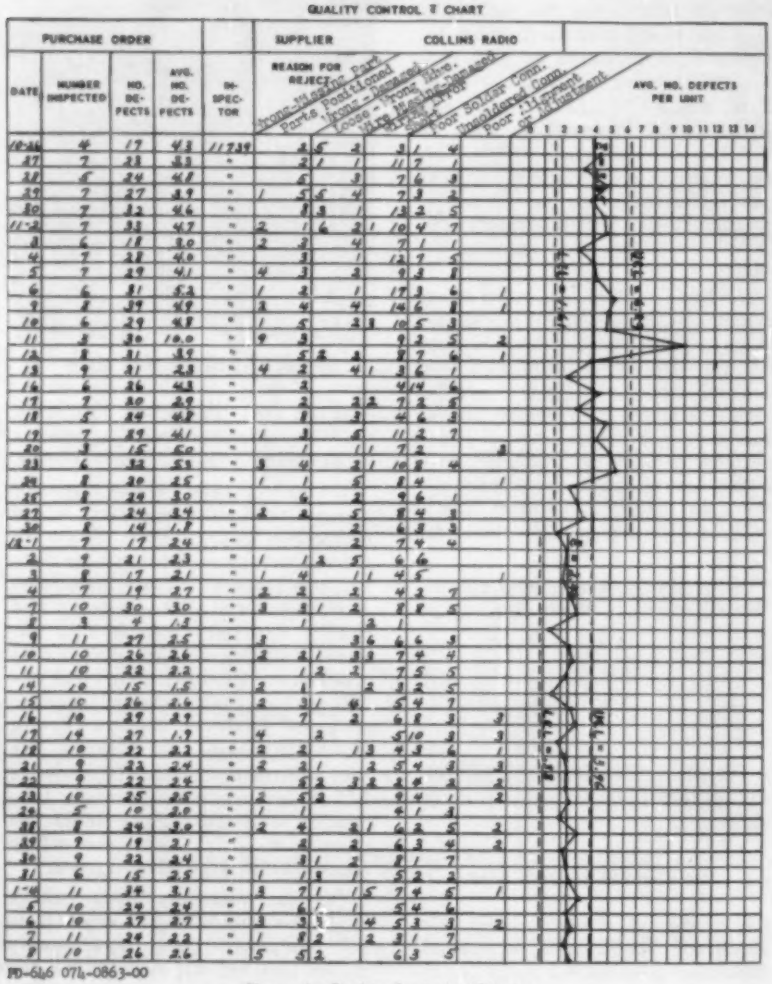
We have a ratio of one inspector to eight production operators in our fabrication departments. Since we started using statistical quality control our inspection costs have been slightly reduced, but our scrap and rework has been considerably reduced. Our salvage department maintains a monthly chart that reflects the percent of the dollar value of parts produced for the month which have been lost as scrap. We are now running slightly under a 0.25 percent scrap loss from our fabrication area and slightly under one percent scrap loss from our whole plant, including purchased parts.

On our assembly lines, where again the quantities are often 10 to 100 equipments, we use a quality model (see Fig. 3), built on our engineering pilot line, as our quality standard. We work very closely with our design engineering department during the building of such models, so that they will meet all our quality standards. These models are then placed on the production lines and are to be duplicated in every detail on all production units.

Inspection is then inserted into the assembly line at points designated by our industrial engineering department. At each inspection station a $\bar{c}$ chart is kept that shows the number of units checked daily, number of errors found, and the error types found. (See Fig. 4.) We analyze these charts and concentrate our inspection efforts on the attributes that fail most frequently. We also are able to reduce our inspection as the quality improves. From these charts, which are prominently displayed along the assembly lines, the production foreman can quickly determine which operations are making the greater number of errors and thus take corrective action.

COLLINS RADIO COMPANY

QUALITY CONTROL $\bar{c}$ CHART



PD-646 071-0863-00

Figure 4—Quality Control $\bar{c}$ Chart

In addition to the $\bar{c}$ charts, the quality control department analyzes the equipment at each inspection station to determine the number of errors possible by counting all attributes such as solder connections, hardware connections, adjustments, etc. After we establish the number of possible errors at each inspection station, we weekly analyze all $\bar{c}$ charts in a foreman's section and divide each $\bar{c}$ average for the week by the number of possible errors and plot this result on a larger 18 by 22 in. chart, which again is prominently displayed as close to each foreman's desk as possible. This chart reflects each foreman's quality trend for the week in relation to his quality goal which is defined by a green color band on the chart. (See Fig. 5.) By recording the number of errors found in relation to the number of errors possible, which reflects the complexity of the equipment involved, we have been able to compare more equitably one foreman's effort with another foreman's effort, regardless of difference in complexity of equipment being built.

Some companies chart the number of errors found in relation to standard hours worked; others chart errors found in relation to dollars spent. We highly recommend any of these methods as long as they stimulate competition among foremen and present the quality achievement in relation to the quality goal.

We have a ratio of one inspector to seven production operators in our assembly departments, which is approximately a 20 percent improvement over our ratio in the past.

A report is published weekly to top management showing the quality level of each job, and a summary sheet lists all production foremen and inspection foremen in the order of quality produced during the previous week. The foreman with the top quality record for the week heads the list while the foreman with the poorest quality record for the week is at the bottom of the list. We include the quality results of our inspection foremen also, and the number of troubles encountered on the assembly lines per week that are the fault of our receiving and fabrication inspection departments. Figures 6 and 7 indicate the quality improvement that has been accomplished by our production departments since we started using statistical quality control.

We purchase a large volume of material at Collins and have always maintained a large receiving inspection department. Here again, statistical quality control has come to our rescue in many ways, one of the most important being the dollars we have saved by its usage. We have evidence that the savings in this department alone are amounting to several thousand dollars per month.

We watch very closely the outgoing quality from this department, and not only have the costs of operating the department gone down, but the number of complaints on parts sent to our assembly lines have gone down correspondingly.

In the past we inspected an average of 300 shipments per day in our receiving inspection department, and had an average of three shipments per day causing trouble on our assembly lines after being passed by our receiving inspection department. Our volume has increased to as high as 500 shipments per day in our receiving inspection department, with our complaints from the assembly lines dropping off to an average of less than one shipment per day.

We use MIL-STD-105A double-sampling plans on a lot by lot basis in our incoming inspection department. The classification of defects, assignment of AQL's, and method of checking is added to our drawings as illustrated in Fig. 8. A reference is provided that explains the method of gaging to be used in regard to code number shown in each arrow.

Figure 5—Quality Trend Chart

Our industrial engineering department supplies such drawings to our quality control department. This information on our drawings and our sampling plans is sent to our vendors, and we have received excellent vendor acceptance of this method. It permits our vendors to know the importance of each dimension and how it will be checked when received at our plant. We have greatly improved the relationship with our vendors, especially those that control their processes in the manner our drawings indicate and gage their parts as specified.

At the time we started using statistical quality control, in 1949, we thought we had an excellent vendor if he sent us no worse than two percent defective parts at any time during an entire year. Now we have many vendors sending us less than one percent defective parts for an entire year and a limited number of vendors that supply us as high as a million parts per year with no defectives. This improvement in quality of incoming parts, of course, has been an important factor in reducing the cost in this department.

Originally, our quality control department started classifying the dimensions on our drawings and assigning AQL's and methods of inspection. We were later able to transfer this work to our industrial engineering department as they have engineers doing similar work for both our production and inspection departments in the form of operation methods charts and inspection methods charts. It was pointed out that the over-all cost to the company was so many dollars whether this work was done in the quality control department or in the industrial engineering department, and that it would appear to save a certain amount of time to have both the inspection charts and drawing classifications performed by the industrial engineering department at the time the drawings were originally reviewed during the writing of the methods and inspection charts.

We feel a further savings can eventually be made if such information can be added to our drawings

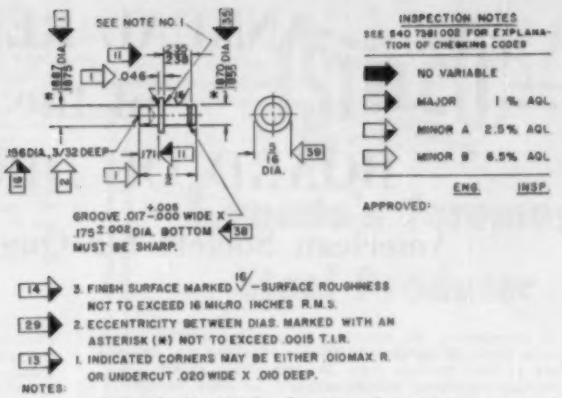

SEE NOTE NO. 1
INSPECTION NOTES
SEE 640 7381 002 FOR EXPLANATION OF CHECKING CODES
NO VARIABLE
MAJOR 1 % AQL
MINOR A 2.5% AQL
MINOR B 6.5% AQL
ENG.
INSP.
APPROVED:
.156 DIA. 3/32 DEEP
GROOVE .017-.000 WIDE X .175 +.002 DIA. BOTTOM MUST BE SHARP.
3. FINISH SURFACE MARKED 16 √ — SURFACE ROUGHNESS NOT TO EXCEED 16 MICRO INCHES R.M.S.
2. ECCENTRICITY BETWEEN DIAS. MARKED WITH AN ASTERISK (*) NOT TO EXCEED .0015 T.I.R.
1. INDICATED CORNERS MAY BE EITHER .010 MAX. R. OR UNDERCUT .020 WIDE X .010 DEEP.
NOTES:

Figure 8—Method for Classifying Dimensions

at the original design stage, but so far this hasn't been accomplished and the work is being done by our industrial engineering department. They work very closely with the design engineers and our quality control department during the classification of such drawings, and this is where we feel additional savings could be accomplished as the design engineer is in the best position to know the importance of each dimension he assigns to a drawing and that if such drawings could reflect the importance of each dimension at the time they are originated, it would not be necessary to review them later for classification. We anticipate approximately two more years work to get caught up on this program. After that time it appears to be a rather simple task to add such information to new drawings that will be added to our system.

Very few of the techniques we are using are original; instead, they are ideas we have obtained through the very valuable associations we have had with other companies. The plant visitations and QC conferences scheduled four or five times each year by our State University of Iowa section have been extremely helpful. We feel that the exchange of ideas which takes place at the various quality control meetings is one of the truly great benefits one can derive from being a member of the American Society for Quality Control.

We do not claim that the SQC system at Collins Radio is a model system with no flaws. In fact, quite the opposite is true. We have our rough spots the same as other companies, but we are certain we are in a much better position now to prevent trouble, and to take corrective action promptly when trouble does occur, than we could possibly have been without the valuable tool of statistical quality control.

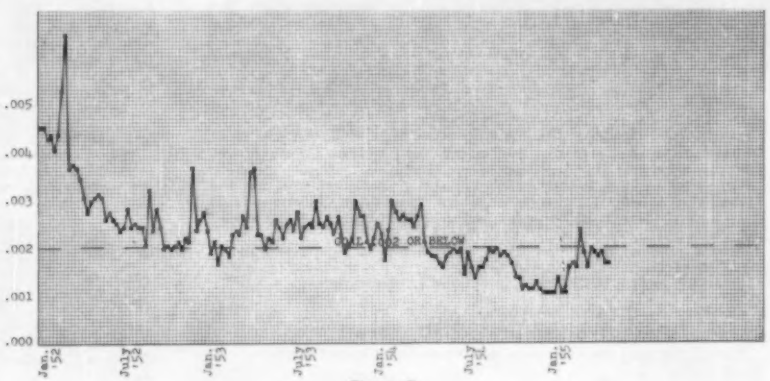



Figure 7

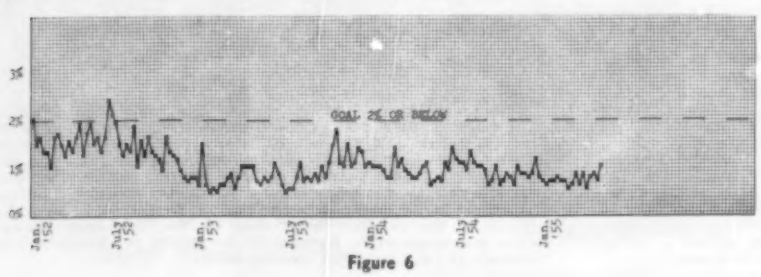



Figure 6

# ANNUAL REPORT
# of the
# BOARD OF DIRECTORS
## American Society for Quality Control, Inc.

The Board of Directors of the American Society for Quality Control, Inc. submits herewith its Annual Report covering the 1955-56 year from July 1, 1955 through June 30, 1956. This report summarizes the outstanding events of the year and the more important decisions made by the Board and its Operating and Executive Committees as previously reported in the journal, *Industrial Quality Control*.

### BOARD OF DIRECTORS

The first meeting of the Board was held on May 24, 1955 at the Hotel Statler in New York for the purpose of electing the five executive directors. The men that were elected are:

Clarence R. Burdick
William P. Goepfert
Paul K. Leatherman
J. Y. McClure
Warren R. Purcell

The mid-year meeting of the Board was held on November 19, 1955 at the Schroeder Hotel in Milwaukee, Wisconsin. The Board approved several proposed amendments to the Constitution and By-Laws which are being presented to the membership on the current ballot and are described in full in the Annual Meeting Notice that was sent to each member.

Following the work of the Office Procedures Committee, the Board unanimously approved the recommendations of the Executive Committee that the Society offices be consolidated at Milwaukee, Wisconsin, that the New York operations be transferred to the consolidated office as quickly as possible without interrupting normal work flow, and that the Society's membership records be transferred from addressograph plates to the IBM punch card system. These moves are completed and are presented in the Executive Secretary's report.

Approved by the Board was a resolution recommended by the Financial Advisory Committee that the City Bank Farmers Trust Company of New York be appointed as the custodian of the ASQC securities portfolio.

Also approved was a resolution by the Board paying tribute to Mr. George D. Edwards on the occasion of his retirement following 42 years of service to the Bell Telephone Laboratories.

### EXECUTIVE AND OPERATING COMMITTEES

During the year the Operating and Executive Committees have met seven times.

May 26, 1955, New York, N. Y.
July 16, 1955, Chicago, Ill. (Oper. Com.)
October 7, 8, 1955, Detroit, Mich.
November 17, 18, 1955, Milwaukee, Wis.
February 10, 11, 1956, Washington, D. C.
March 24, 1956, Chicago, Ill. (Exec. Com.)
April 20, 21, 1956, New York, N. Y.

The following principal actions were taken by these committees.

1. Plans were made to enable the Vice President, Membership Relations, to develop the formation of student branches. Immediately following these plans, the Iowa Section reported work on the formation of two student branches. These are still in the process of development.
2. In conjunction with the office consolidation, the appointments of S. A. Oliva and L. S. Eichelberger as Deputy Executive Secretaries were approved.
3. On recommendation of the Professional Ethics and Qualifications Committee, approval was given to the use of the official title of "Quality Control Consultant" by those ASQC members in the consulting field who might desire to use it.
4. A contract was approved with the American Decorating Company of Cleveland to handle all of the exhibit booth arrangements and sales.
5. After due investigation the committee decided not to have the ASQC seal registered at the U. S. Patent Office.
6. During January printing of the 1955-56 yearbook was completed and mailed to all members who had previously requested a copy. Details are given in the Report of Yearbook Committee.
7. The office consolidation move and transfer of membership records to the IBM system, as approved by the Board of Directors in November, has all been pretty well completed, except for the selection of the Administrative Secretary. In spite of the great amount of work done in this phase of consolidation, it has not yet been possible to bring it to a satisfactory conclusion. Accordingly a commitee under the chairmanship of Mr. Alfred L. Davis was appointed to further study and resolve the problem.

### ACKNOWLEDGMENTS

The Board of Directors acknowledges the continued services of the Officers, Executive Directors, Division Chairmen, Technical Committee Chairmen, and Section Chairmen who have carried forward the work of the Society.

In the field of publications, the Board expresses its thanks to the Chairman of the Editorial Board and his associates for the fine journal, *Industrial Quality Control*.

Another year marked by many forward steps and accomplishments comes to a close with a fine record. The Society is indebted to many individuals who, at the expense of personal time and energy, have made these accomplishments possible.

Anderson, Indiana
June 30, 1956

For the Board of Directors
ARTHUR BENDER, JR.
President

**Appendix A: Report of the Executive Secretary**

Again this year the Society reached a new high in membership, having on its roster as of June 30, 1956 a total of 9671 members. While this is a little short of the goal of 10,000 set for our Tenth Anniversary Year, the net gain was 891. This is a considerable improvement over last year's net gain of 232, and represents the results of the combined efforts of our Membership Committee and the effective work of many Section people.

Renewals, at 78 percent, showed appreciable gain over last year's 75 percent and compared favorably with our 1951-52 all-time high of 81 percent. New members totaled 2781, compared with 2399 last year. A record of our membership growth is shown in Exhibit A, attached to this report.

The complete membership count by Sections, Districts and grades of membership is shown in Exhibit B of this report.

The following new Sections were established during the period July 1, 1955 to June 30, 1956:

| | *Section No.* |
|---|---|
| Corning-Elmira (New York) | 87 |
| Tucson (Arizona) | 88 |
| Waco (Texas) | 89 |
| Memphis (Tennessee) | 90 |
| Cumberland (Maryland) | 91 |
| St. Catharines (Ontario) | 92 |

As of June 30, one petition for Section status, from the Richmond (Indiana) Subsection, was pending. Inquiries were received from several other groups.

#### Institutional Subscriptions

Public and private library subscriptions to *Industrial Quality Control* also reached a record high, there being a total of 963 as of June 30, 1956. Special efforts were directed to this activity during the early part of the fiscal year, with emphasis placed on publicizing the two and three year rates. Currently steps are being taken to increase the coverage of libraries in the United States.

#### Employment Service

During the year the office of the Executive Secretary continued to serve Society members by acting in an employment clearing house capacity for individuals and industry. As previously noted, this program is not a formal one, but the service is available to members and can be used to supplement the work of the Sections and Divisions in this area. The results of studies of the Society's several placement activities were contained in a statement of "Policies for the Conduct of Division and Section Employment Services," copies of which were sent to all Section and Division Chairmen.

#### Yearbook

The unprecedented and unanticipated heavy return of information cards bearing changes in personal membership data delayed the publication of the 1955-56 Yearbook several months. Over 4000 cards were returned, most of which required addressograph plate changes before galleys for the Yearbook could be run off. Not only was the Yearbook delayed, but this clerical load resulted in delayed billing of dues and in the subsequent processing of Remittance Reports. As a result of the excellent work done by the Milwaukee Section people, who prepared the material for the printer, the Yearbook was published and distributed in January, 1956.

### Office Consolidation and Relocation

In accordance with the program established by the Office Procedures Committee, and approved by the Board of Directors, the headquarters office of the Society was moved from New York to Milwaukee, at the same time consolidating the Executive Secretary's office with the Publications office. Certain of the operations of the New York office were transferred in January, with entire move completed on March 30, 1956. Enlarged quarters in Milwaukee now provide adequate space for the combined staff. Satisfactory termination arrangements were made for our leased space in New York. The new quarters are 65 percent larger than the combined earlier New York and Milwaukee offices; the charge for rent is less than ten percent greater than the combined rentals of the two offices. Space allocations in the new office anticipate ultimate transfer of much of the Treasurer's work to Milwaukee, as well as the employment of an Administrative Secretary.

### Personnel

Coincident with the shift of operations to Milwaukee, a new staff was started at that location to handle the Executive Secretary's work load. Currently this staff consists of four clerk-typists and one bookkeeper under the direction of Miss Jean Truettner, who joined the Society's staff in February. Miss Truettner, as a member of the Milwaukee Section, has been active in Society affairs for a number of years and, as an employee of the A. O. Smith Corporation, was secretary to the late Raymond S. Saddoris.

The work load of the Milwaukee office requires additional personnel, and qualified people are being added as they become available.

At the time the decision was made to move the headquarters' office to Milwaukee (November, 1955), suitable termination arrangements were made for our New York employees, consisting of Mr. Julian S. Herz and a staff of four. Premium pay and termination allowances resulted in retention of the New York staff until March 30, 1956, at which time that office was closed.

### Office Procedures

At the instigation of President Bender, studies were started last year looking toward modernization of our membership record keeping system. These studies indicated that a punched card system offered considerable advantage over the addressograph system. Accordingly, in cooperation with Workman Service, Inc., a commercial service organization in Chicago, preliminary studies were made to determine the feasibility of and the economic factors involved in utilization of punched cards for keeping on record pertinent data concerning the members of the Society, and for using these cards to provide the information needed periodically and from time to time in the course of Society activities. On the basis of favorable indications, the Executive Committee approved the expenditure of funds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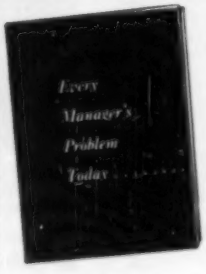


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for carrying out the initial phases of this work, viewing the establishment of the intial card file as an investment in the Society's future operation and growth.

The combined Publications and Executive Secretary's staffs are currently carrying on the detailed work of placing the new system into operation. The conversion from addressograph to punched cards is a tremendous undertaking and several months will be required to establish all of the new routines. The new system should result in considerably improved service to the individual members, the Sections, the Divisions, and to the Officers and Committees of the Society.

### Exhibit A—Record of Membership Growth

| Date | Members | % Renewal | Net Gain | % Gain | New Members | Active Sections | Members Rec'd. for Following Fiscal Year |
|---|---|---|---|---|---|---|---|
| June 30, 1947 | 1926 | | | | 1926 | 25 | * |
| June 30, 1948 | 2102 | * | 176 | 9 | * | 31 | * |
| June 30, 1949 | 2638 | 75 | 536 | 25 | 1058 | 35 | * |
| June 30, 1950 | 3510 | 77 | 872 | 33 | 1489 | 42 | 58 |
| June 30, 1951 | 4245 | 80 | 735 | 21 | 1422 | 48 | 167 |
| June 30, 1952 | 6109 | 81 | 1864 | 44 | 2669 | 60 | 207 |
| June 30, 1953 | 7430 | 75 | 1321 | 22 | 2846 | 71 | 146 |
| June 30, 1954 | 8548 | 77 | 1118 | 15 | 2798 | 80 | 254 |
| June 30, 1955 | 8780 | 75 | 232 | 3 | 2399 | 86 | 177 |
| June 30, 1956 | 9671 | 78 | 891 | 10 | 2781 | 92 | 184 |

*No Record

### Exhibit B—Membership Report 1955-56

| | Membership June 30, 1955 | Membership June 30, 1956 | | | |
|---|---|---|---|---|---|
| **District 1** | Total | Fellows | Sr. Members | Members | Total |
| Boston | 168 | 7 | 34 | 146 | 187 |
| Burlington | 36 | | 4 | 20 | 24 |
| Buzzards Bay | 45 | | 3 | 47 | 111 |
| Hartford | 133 | 1 | 24 | 109 | 134 |
| New Hampshire | 16 | | 6 | 16 | 22 |
| New Haven | 81 | 3 | 21 | 54 | 78 |
| Pittsfield | 49 | | 2 | 57 | 59 |
| Rhode Island | 79 | 3 | 14 | 83 | 100 |
| So. Conn. | 118 | 2 | 30 | 112 | 144 |
| W. Mass. | 70 | 4 | 17 | 48 | 70 |
| Worcester | 65 | 2 | 7 | 62 | 70 |
| Total | 860 | 22 | 162 | 754 | 938 |
| **District 2** | | | | | |
| Albany | 79 | 4 | 19 | 66 | 89 |
| Binghamton | 100 | 1 | 16 | 74 | 91 |
| Buffalo | 83 | | 21 | 66 | 87 |
| Corning-E. | | | 10 | 96 | 106 |
| Mid-Hudson | 101 | | 16 | 77 | 93 |
| Rochester | 123 | 10 | 68 | 57 | 135 |
| Syracuse | 114 | 2 | 24 | 81 | 107 |
| Utica | 41 | | 8 | 26 | 34 |
| Total | 641 | 17 | 182 | 543 | 742 |
| **District 3** | | | | | |
| Metropolitan | 602 | 28 | 148 | 457 | 633 |
| **District 4** | | | | | |
| Hamilton | | 1 | 5 | 39 | 45 |
| Montreal | 86 | 1 | 11 | 85 | 97 |
| St. Catharines | | | | | |
| Toronto | 121 | 1 | 12 | 112 | 125 |
| W. Ontario | 50 | | 6 | 37 | 43 |
| Windsor | 34 | | 9 | 44 | 53 |
| Total | 291 | 3 | 43 | 317 | 363 |
| **District 5** | | | | | |
| Allentown-B. | 56 | 1 | 6 | 78 | 85 |
| Danville-S. | 48 | | 4 | 37 | 41 |
| Erie | 39 | | 3 | 34 | 37 |
| Harrisburg | 74 | | 4 | 67 | 71 |
| Lansdale | 66 | 3 | 9 | 43 | 55 |
| Philadelphia | 259 | 5 | 76 | 168 | 249 |
| Pittsburgh | 112 | 6 | 30 | 76 | 112 |
| Scranton-W. B. | 65 | | 6 | 59 | 65 |
| Trenton | 40 | | 6 | 27 | 33 |
| Total | 750 | 15 | 144 | 589 | 748 |
| **District 6** | | | | | |
| Baltimore | 129 | 3 | 19 | 103 | 125 |
| Carolinas | 64 | | | 58 | 58 |
| Cumberland | | | 1 | 31 | 32 |
| Delaware | 62 | 4 | 7 | 63 | 76 |
| Richmond | 44 | | 11 | 31 | 42 |
| Washington | 102 | 8 | 22 | 85 | 113 |
| Total | 401 | 15 | 60 | 371 | 446 |
| **District 7** | | | | | |
| Cleveland | 294 | 13 | 92 | 232 | 337 |
| **District 8** | | | | | |
| Cincinnati | 151 | 2 | 10 | 161 | 173 |
| Columbus | 100 | 2 | 11 | 98 | 111 |
| Dayton | 111 | 4 | 16 | 110 | 130 |
| Parkersburg | 22 | | | 41 | 41 |
| Toledo | 84 | 2 | 9 | 81 | 92 |
| Youngstown | 40 | 1 | 5 | 54 | 60 |
| Total | 508 | 11 | 51 | 545 | 607 |
| **District 9** | | | | | |
| Evansville-O. | 35 | | 4 | 27 | 31 |
| Grand Rapids | 45 | 1 | 4 | 29 | 34 |
| Gr. Muskegon | 26 | | 8 | 24 | 32 |
| Indianapolis | 315 | 5 | 45 | 238 | 288 |
| Muncie | 56 | 1 | 8 | 33 | 42 |
| N. E. Indiana | 48 | 1 | 12 | 46 | 59 |
| So. Bend-M. | 74 | | 8 | 117 | 125 |
| Total | 599 | 8 | 89 | 514 | 611 |
| **District 10** | | | | | |
| Michigan | 450 | 12 | 86 | 347 | 445 |
| **District 11** | | | | | |
| Chicago | 615 | 15 | 125 | 503 | 643 |
| **District 12** | | | | | |
| Central Ill. | 38 | 2 | 23 | 26 | 51 |
| Iowa | 193 | 7 | 58 | 114 | 179 |
| Milwaukee | 226 | 2 | 50 | 163 | 215 |
| Minnesota | 218 | 1 | 22 | 162 | 185 |
| Racine | 39 | | 6 | 41 | 47 |
| Rockford | 36 | 2 | 12 | 28 | 42 |
| Winnebago | 40 | 1 | 8 | 34 | 43 |
| Total | 790 | 15 | 179 | 568 | 762 |
| **District 13** | | | | | |
| Denver | 36 | 1 | 4 | 49 | 54 |
| Kansas City | 47 | | 14 | 67 | 81 |
| Lincoln | 40 | 1 | 11 | 31 | 43 |
| St. Louis | 121 | 7 | 54 | 98 | 159 |
| Wichita | 110 | | 26 | 162 | 188 |
| Total | 354 | 9 | 109 | 407 | 525 |
| **District 14** | | | | | |
| Albuquerque | 60 | 1 | 8 | 68 | 77 |
| Baton Rouge-N. O. | 25 | | 2 | 50 | 52 |
| Dallas-Ft. W. | 115 | 1 | 23 | 145 | 169 |
| Mexico City | 30 | | | 44 | 44 |
| San Antonio | 32 | | 2 | 30 | 32 |
| So. Texas | 58 | 1 | 15 | 58 | 74 |
| Waco | | | 2 | 37 | 39 |
| Total | 320 | 3 | 52 | 432 | 487 |
| **District 15** | | | | | |
| Birmingham | 40 | | 4 | 58 | 62 |
| Chattanooga | 27 | | 5 | 34 | 39 |
| Georgia | 89 | 1 | 18 | 40 | 59 |
| Huntsville | 21 | | 3 | 13 | 16 |
| Louisville | 68 | | 10 | 66 | 76 |
| Memphis | | | 5 | 23 | 28 |
| Tennessee | 50 | 2 | 12 | 24 | 38 |
| Total | 295 | 3 | 57 | 258 | 318 |
| **District 16** | | | | | |
| Japan | 72 | | 18 | 56 | 74 |
| Los Angeles | 301 | 8 | 96 | 231 | 335 |
| Port'and | [illegible] | | [illegible] | 37 | 39 |
| Salt Lake City | 26 | | 1 | 20 | 21 |
| San Bernardino | 71 | 1 | 15 | 72 | 88 |
| San Diego | 122 | | 60 | 50 | 110 |
| San Francisco | 123 | 2 | 24 | 101 | 127 |
| Seattle | 65 | 2 | 7 | 64 | 73 |
| Tucson | | | 1 | 35 | 36 |
| Total | 811 | 13 | 224 | 656 | 903 |
| Members-at-large | 173 | 1 | 35 | 127 | 163 |
| Members-in-training | 27 | | | | (26) |
| GRAND TOTALS | 8780 | 203 | 1838 | 7630 | 9671 |

**Appendix B: Report of the Treasurer**

Herewith are the Statement of Cash Receipts and Disbursements for the fiscal year ended June 30, 1956 (Exhibit C,) the Balance Sheet as of June 30, 1956 (Exhibit D,) and the Record of the Marketable Securities held by the Society as of June 30, 1956 (Exhibit E).

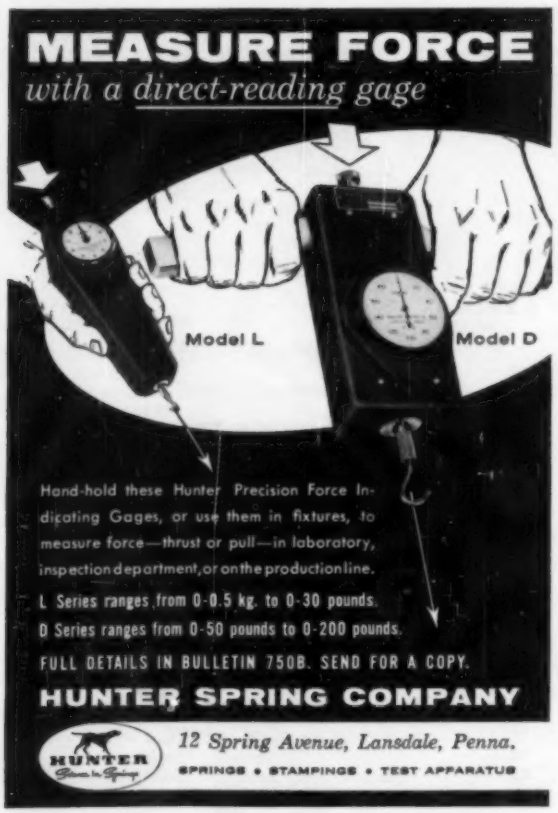
Waterbury, Conn.
June 30, 1956

E. E. SCHIESEL
Treasurer

## Exhibit C—Statement of Cash Receipts and Disbursements, Year Ended June 30, 1956

### CURRENT FUNDS

| | | | |
|---|---|---|---|
| **Receipts** | | | |
| Membership dues: | | | |
| Members-in-training | | $ 126.50 | |
| Regular members | | 43,450.00 | |
| Senior members | | 14,523.00 | |
| Fellows | | 1,306.00 | |
| Overpayments, less refunds | | 44.34 | $ 59,449.84 |
| Publications: | | | |
| Advertising | $35,814.21 | | |
| Library subscriptions | 11,349.28 | | |
| Sales of back issues | 2,041.76 | | |
| Sales of reprints | 960.06 | $50,165.31 | |
| Less cost of back issues and reprints | | 438.32 | 49,726.99 |
| Sales of conference papers and other technical literature | | | 2,797.51 |
| Sales of membership certificates net of cost thereof | | | 307.57 |
| Sales of pins and insignia net of cost thereof | | | 193.82 |
| Interest received on bank deposits | | | 461.84 |
| Miscellaneous income | | | 119.09 |
| Amounts withheld from employees for income and social security taxes | | $ 5,765.40 | |
| Less amounts paid to Director of Internal Revenue | | 5,043.42 | 721.98 |
| TOTAL RECEIPTS | | | $113,778.64 |
| **Disbursements** | | | |
| Publications: | | | |
| Cost of authors' reprints | $ 1,592.68 | | |
| Less cash received from authors | 182.49 | $ 1,410.19 | |
| Publishing: | | | |
| Magazine | $34,418.31 | | |
| Yearbook | 4,888.85 | | |
| Sundry | 231.97 | 39,539.13 | |
| Postage and mailing expenses: | | | |
| Magazine | $ 2,921.81 | | |
| Back issues | 747.14 | | |
| Yearbook | 976.08 | | |
| General | 469.47 | 5,114.50 | |
| Salaries | | 18,545.91 | |
| Advertising: | | | |
| Commissions and discounts | $ 3,880.23 | | |
| Promotion | 547.04 | | |
| Contract commission—L. B. Hammond | 1,200.00 | | |
| Contract commission—Weston & Weston | 1,950.00 | | |
| Sundry | 431.60 | $ 8,008.87 | |
| Office supplies and expense | | 1,343.28 | |
| Rent | | 2,137.41 | |
| Traveling expenses | | 724.54 | |
| Printing and mimeographing | | 456.50 | |
| Office furniture and equipment | | 80.00 | $ 77,360.33 |
| Committee and sections: | | | |
| Traveling expenses | | $ 34.71 | |
| Printing, mimeographing and postage | | 72.97 | |
| Annual report and sundry expenses | | 446.86 | $ 554.54 |
| President and Vice President: | | | |
| Traveling expenses | | $ 39.50 | |
| Office supplies and expense | | 554.13 | |
| Committee expenses | | 570.80 | |
| Postage | | 331.30 | 1,495.73 |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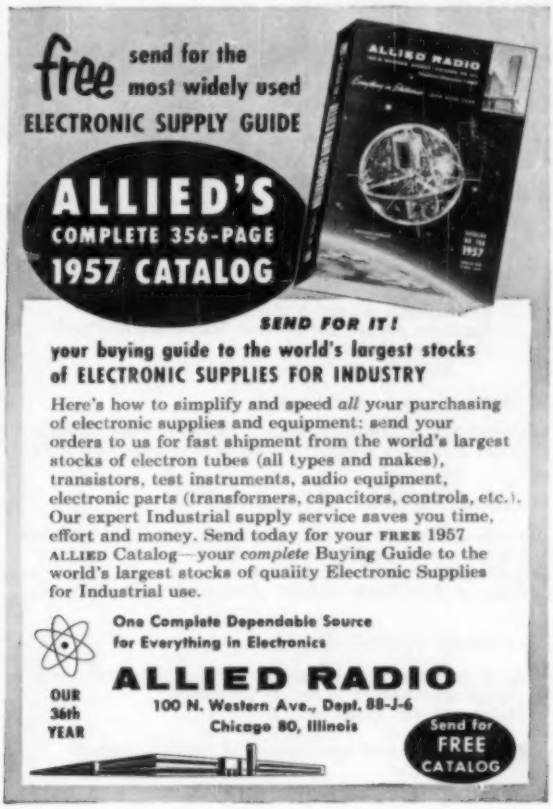
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| | | |
|---|---|---|
| Executive Secretary: | | |
| Secretarial salaries | $16,822.86 | |
| Printing and mimeographing | 3,539.78 | |
| Postage | 1,554.35 | |
| Office supplies and expense | 1,857.44 | |
| Office rent | 2,046.70 | |
| Traveling expense | 1,374.97 | |
| Office maintenance | 413.71 | |
| Office furniture and equipment | 1,925.35 | |
| Relocation expense | 4,328.89 | |
| Sundry expenses | 80.16 | 33,944.21 |
| Treasurer: | | |
| Secretarial service | $ 140.00 | |
| Insurance | 268.94 | |
| Professional services | 450.00 | |
| Office supplies and expense | 183.97 | 1,042.91 |
| General: | | |
| Transfer to Investment Income Fund | $10,000.00 | |
| Pay roll tax expense | 820.36 | |
| Advance to 1956 Convention committee | 3,000.00 | |
| Increase in amount of imprest petty cash fund | 100.00 | 13,920.36 |
| TOTAL DISBURSEMENTS | | $128,318.08 |
| EXCESS OF DISBURSEMENTS OVER RECEIPTS | | $ 14,539.44 |
| Cash on hand and on deposit at June 30, 1955 | | 34,062.80 |
| Cash on hand and on deposit at June 30, 1956 | | $ 19,523.36 |

**SPECIAL FUNDS**

| | | |
|---|---|---|
| **Brumbaugh Award Fund:** | | |
| Receipts: | | |
| Interest on bank deposit | | $ 57.99 |
| Contribution by Metropolitan Section | | 50.00 |
| Contribution by St. Louis Section | | 50.00 |
| | | $ 157.99 |
| Cash award to Ralph Allen Bradley | | 50.00 |
| EXCESS OF RECEIPTS OVER DISBURSEMENTS | | $ 107.99 |
| Cash on deposit at June 30, 1955 | | 2,053.27 |
| Cash on deposit at June 30, 1956 | | $2,161.26 |
| **Saddoris Award for Section Management Fund:** | | |
| Receipts: | | |
| Interest on bank deposit | | $ 1.83 |
| Contribution by Milwaukee Section | | 100.00 |
| | | $ 101.83 |
| Disbursements: | | |
| Cost of engraving certificates | $ 131.00 | |
| Sundry expenses | 8.11 | 139.11 |
| EXCESS OF DISBURSEMENTS OVER RECEIPTS | | $ 37.28 |
| Cash on deposit at June 30, 1955 | | 83.85 |
| Cash on deposit at June 30, 1956 | | $ 46.57 |
| **Shewhart Medal Fund:** | | |
| Receipts: | | |
| Interest on bank deposit | | $ 23.53 |
| Contribution by Metropolitan Section | | 50.00 |
| Contribution by St. Louis Section | | 50.00 |
| | | $ 123.53 |
| Costs of lettering and engraving | | 53.66 |
| EXCESS OF RECEIPTS OVER DISBURSEMENTS | | $ 69.87 |
| Cash on deposit at June 30, 1955 | | 808.92 |
| Cash on deposit at June 30, 1956 | | $ 878.79 |

## Exhibit D—Balance Sheet as of June 30, 1956

### ASSETS

| | | | | |
|---|---|---|---|---|
| Cash: | | | | |
| Current funds: | | | | |
| On hand for deposit | | $ 3,393.87 | | |
| Demand deposit | | 2,845.00 | | |
| Time deposits—general | | 6,507.71 | | |
| Time deposit—convention reserve fund | | 6,776.78 | $19,523.36 | |
| Petty cash funds | | | 161.69 | |
| Special funds: | | | | |
| Investment income—demand deposits | | $ 1,369.97 | | |
| Time deposits: | | | | |
| Brumbaugh Award Fund | $ 2,161.26 | | | |
| Saddoris Award for Section Management Fund | 46.57 | | | |
| Shewhart Medal Fund | 878.79 | 3,086.62 | 4,456.59 | $ 24,141.64 |
| Marketable securities (at cost): | | | | |
| United States Treasury bonds (quoted market—$22,622.20) | | | $22,890.79 | |
| Other marketable securities (quoted market—$70,610.65) | | | 62,001.58 | 84,892.37 |
| Accounts receivable: | | | | |
| From sale of advertising, magazine reprints, conference papers, technical literature, etc. | | | $ 2,732.97 | |
| Advances to convention committee | | | 4,500.00 | |
| State of New York—refund of unemployment insurance | | | 162.00 | 7,394.97 |
| Inventories—at nominal amounts: | | | | |
| Back issues of Industrial Quality Control conference papers and other technical literature | | | $ 1.00 | |
| Stationery and supplies | | | 1.00 | 2.00 |
| Office furniture and equipment—at nominal amount | | | | 1.00 |
| | | | | $116,431.98 |

## LIABILITIES, RESERVES, AND SURPLUS

| | | | |
|---|---|---|---|
| Accounts payable | | | $ 16,730.83 |
| Pay roll taxes, and taxes withheld from employees' compensation | | | 1,453.39 |
| Deferred income: | | | |
| Membership dues paid in advance | | $ 1,207.00 | |
| Estimated unearned portion of library subscriptions | | 5,516.26 | 6,723.26 |
| Reserves: | | | |
| For Brumbaugh Award Fund | $ 2,161.26 | | |
| For Saddoris Award for Section Management Fund | 46.57 | | |
| For Shewhart Medal Fund | 878.79 | $ 3,086.62 | |
| For possible losses on securities | | 5,000.00 | 8,086.62 |
| Surplus | | | 83,437.88 |
| | | | $116,431.98 |

## Exhibit E—Marketable Securities as of June 30, 1956

| Description | Rate | Maturity | Principal Amount | Cost | Market Value | Income Received During the Year |
|---|---|---|---|---|---|---|
| **United States Bonds:** | | | | | | |
| U. S. Treasury bonds | 2½% | 1964/69 | $ 3,000.00 | $ 2,910.31 | $ 2,855.63 | $ 75.00 |
| U. S. Treasury bonds | 2½% | 1958 | 5,000.00 | 4,978.44 | 4,960.94 | 125.00 |
| U. S. Treasury bonds | 2½% | 1965/70 | 2,000.00 | 2,021.88 | 1,898.75 | 50.00 |
| U. S. Treasury bonds | 2¾% | 1961 | 10,000.00 | 9,969.53 | 9,912.50 | 261.25 |
| U. S. Treasury bonds | 3% | 1995 | 3,000.00 | 3,010.63 | 2,994.38 | 45.00 |
| | | | | $22,890.79 | $22,622.20 | $ 556.25 |
| **Other Bonds:** | | | | | | |
| Aluminum Company of America | 3⅛% | 2-1-64 | 2,000.00 | 1,997.85 | 1,995.00 | 62.50 |
| American Tobacco Company | 3% | 4-15-62 | 2,000.00 | 1,963.50 | 1,965.00 | 60.00 |
| Baltimore & Ohio Railroad Company | 4¼% | 10-1-95 | 2,000.00 | 1,696.00 | 1,852.50 | 203.34 |
| Bethlehem Steel Corporation | 2¾% | 7-15-70 | 1,000.00 | 915.80 | 941.25 | 27.50 |
| Cincinnati Gas & Electric Company | 2¾% | 10-1-75 | 2,000.00 | 1,839.10 | 1,842.50 | 55.00 |
| Cleveland Electric Illuminating Company | 3% | 7-1-70 | 2,000.00 | 2,017.85 | 1,955.00 | 60.00 |
| Consolidated Edison Company of New York | 3% | 11-1-72 | 1,000.00 | 963.30 | 965.00 | 30.00 |
| Pacific Gas & Electric Company | 3½% | 6-1-66 | 2,000.00 | 2,057.85 | 2,040.00 | 70.00 |
| Pennsylvania Railroad Company | 4¼% | 4-1-81 | 4,000.00 | 3,819.50 | 4,000.00 | 170.00 |
| Province of Ontario | 3⅞% | 5-15-81 | 3,000.00 | 3,075.00 | 3,052.50 | — |
| Standard Oil Company of New Jersey | 2¾% | 7-15-74 | 2,000.00 | 1,811.00 | 1,890.00 | 55.00 |
| | | | | $22,156.75 | $22,498.75 | $ 793.34 |
| | **Shares** | | **Par Value** | | | |
| **Preferred Stocks:** | | | | | | |
| American Cyanamid Compay, cumulative convertible | 20 | 3¾% | 100.00 | 2,226.35 | 2,925.00 | 75.00 |
| Consolidated Edison Company of New York, cumulative | 10 | $5.00 | none | 1,094.10 | 1,100.00 | 50.00 |
| E. I. DuPont de Nemours and Company, cumulative | 15 | $3.50 | none | 1,392.15 | 1,425.00 | 52.51 |
| Charles Pfizer & Company, Inc., cumulative 2nd | 30 | 4% | 100.00 | 3,217.80 | 3,116.25 | 80.00 |
| Virginia Railway Company, cumulative | 40 | 6% | 25.00 | 1,159.76 | 1,270.00 | 60.00 |
| General Tire & Rubber Company, cumulative convertible | 30 | 4½% | 100.00 | 3,442.65 | 3,210.00 | 67.50 |
| | | | | $12,532.81 | $13,046.25 | $ 385.01 |
| **Common Stocks:** | | | | | | |
| American Smelting & Refining Company | 25 | | none | 1,090.40 | 1,271.88 | 80.00 |
| American Telephone & Telegraph Company | 24 | | 100.00 | 3,667.22 | 4,320.00 | 197.03 |
| Cleveland Electric Illuminating Company | 40 | | 15.00 | 1,051.20 | 1,640.00 | 64.00 |
| Commonwealth Edison Company of New York | 30 | | 25.00 | 913.98 | 1,215.00 | 60.00 |
| Dow Chemical Company | 100 | | 5.00 | 5,234.75 | 7,637.50 | — |
| First National City Bank of New York | 25 | | 20.00 | 1,334.85 | 1,578.13 | 63.75 |
| General Electric Company | 50 | | 5.00 | 2,887.50 | 3,050.00 | — |
| General Public Utilities Corporation | 43 | | 5.00 | 1,104.80 | 1,531.88 | 76.33 |
| Norfolk and Western Railroad Company | 25 | | 25.00 | 1,207.32 | 1,796.88 | 93.75 |

| | | | | | |
|---|---|---|---|---|---|
| Pacific Gas and Electric Company | 30 | 25.00 | 1,145.53 | 1,500.00 | 67.50 |
| Public Service Electric and Gas Company | 50 | none | 1,387.56 | 1,662.50 | 85.00 |
| Standard Oil Company of Indiana | 50 | 25.00 | 2,981.25 | 3,006.25 | — |
| Standard Oil Company of New Jersey | 85 | 7.00 | 3,305.66 | 4,855.63 | 127.50 |
| | | | $27,312.02 | $35,065.65 | $ 914.86 |
| | | | $84,892.37 | $93,232.85 | $ 2,649.46 |

**Add:**

| | | |
|---|---|---|
| Cash on deposit at June 30, 1955 | $ 1,797.06 | |
| Proceeds from sale of securities and rights | 20,449.55 | |
| Dividends and interest received on securities sold or redeemed | 524.33 | |
| Transfer from current funds | 10,000.00 | 32,770.94 |
| | | $35,420.40 |

**Deduct:**

| | | |
|---|---|---|
| Purchase of securities | $33,873.19 | |
| Interest purchased | 140.89 | |
| Fund operating costs | 36.35 | 34,050.43 |
| Cash on deposit—investment income account—June 30, 1956 | | $ 1,369.97 |

### Certificate of Audit

We have examined the balance sheet of American Society for Quality Control, Incorporated as of June 30, 1956, and the statement of cash receipts and disbursements for the year then ended, and without making a detailed audit of the transactions, have examined or tested accounting records maintained by the Treasurer of the Society, and other supporting evidence as hereinafter stated.

Petty cash funds were reported to us by the custodians of the funds. Current funds on hand for deposit and cash on deposit at June 30, 1956, was reconciled with amounts confirmed to us by the depositaries. We traced the recorded cash receipts for four months selected by us, to deposits shown by bank statements on file, and examined cancelled bank checks, invoices, and other data supporting the recorded disbursements for the same period. We accounted for the recorded cash received for membership dues for the year ended June 30, 1956, by inspection of membership remittance advices. We also reconciled the recorded amounts for sales of advertising and reprints for the year ended June 30, 1956, with amounts reported to us by the Managing Editor of the Society's publication.

Marketable securities were confirmed by direct communication with City Bank Farmers Trust Company, New York, New York, as custodian for the Society, and we reconciled the reported income therefrom with the cash on deposit which was reported to us by the custodian.

Net proceeds of the Tenth Annual Convention in the amount of $5,971.86 had not been remitted by the Convention Committee to the Treasurer of the Society at June 30, 1956. Of this amount $4,500.00 for advances to the Convention Committee is reflected in the accompanying balance sheet.

Accounts receivable at June 30, 1956, are represented by unpaid invoices on file as of that date, and estimated deferred subscription income is based upon information furnished to us by the Managing Editor of the Society's publication.

In our opinion, based upon our examination as outlined above, the accompanying balance sheet and statement of cash receipts and disbursements present fairly the financial position of American Society for Quality Control, Incorporated at June 30, 1956, and the recorded cash transactions of the Society for the year then ended.

New York, N. Y.
August 3, 1956

Ernst & Ernst
Certified Public Accountants

## Appendix C—Report of the Editorial Board

*Purpose of the Board*

It is the function of the Editorial Board to have operating supervision of *Industrial Quality Control* and all other technical publications of the Society.

*Advertising*

This is the first fiscal year the journal has operated fully on a monthly basis. A review of the advertising support for these issues will be found in the report of Leon Bass, Vice President.

*Data on Volume XII*

These twelve issues consisted of 580 pages, plus 8 pages for an Index to Vol. XII bound as part of the June issue (No. 12), plus 48 cover pages. Of the 580 pages available for editorial copy, 427.5, or about 74 per cent were used for this purpose; the remaining 26 per cent were paid ads. Of the 48 cover pages, 30 were for paid ads, 12 for front covers, 3 for ASQC publicity, and 3 unused for any purpose.

Issue No. 8 (February 1956) was a 52-page anniversary issue commemorating the highlights of the first ten years of the Society's existence. No contributed papers were published in this issue, but 8½ pages were provided to maintain continuity in the Local Section News items. Also, paid ads used 9 of these 52 pages.

In the 528 pages of the remaining eleven issues, 50 contributed articles were published, averaging 3.7 pages per article and ranging from one page to 8½ pages in length. Percentagewise, these 528 pages were distributed as follows:

| | |
|---|---|
| Contributed papers | 35% |
| Paid ads | 26½% |
| Local Section News | 16% |
| Departmental Copy (Including ASQC News) | 11½% |
| Miscellaneous (Masthead and Contents pages, editorials, ASQC Convention Publicity, Stock Lists, Annual Reports, etc.) | 11% |
| | 100% |

The 50 contributed papers can be classified as follows:

| | |
|---|---|
| General applications of SQC methods | 6 |
| Special application of SQC methods | |
| Aircraft | 4 |
| Chemical | 3 |
| Clerical | 1 |
| Paper | 1 |
| Sampling | 3 |
| Textile | 2 |
| Special Topics | |
| Operations Research | 6 |
| Linear Programming | 3 |
| General Interest | 14 |
| Technical | 7 |

*Reprints*

During Vol. XII, 30 contributor's orders for a total of 8,800 reprints on a shared cost basis were processed. Non-contributor requests for permission to reprint items in IQC have totaled 41 in the period July 1955-July 1956.

*Editorial Board*

The following men have accepted appointment to the Editorial Board for a five-year term beginning July 1, 1956: Dame S. Hamby, Edgar P. King, Charles R. Hicks. The three men retiring from the Board as of June 30, 1956 are: Warren R. Purcell, Harry G. Romig, and John W. Tukey.

Grateful acknowledgment is due the following men for editorial assistance in reviewing submitted manuscripts in cooperation with the Editorial Board: Ralph A. Bradley; Thomas A. Budne; Irving W. Burr; Simon Collier; Cecil C. Craig; Allen R. Crawford; Harold F. Dodge; Eugene L. Grant; Frank E. Grubbs; John A. Henry; John D. Hinchen; Howard L. Jones; Joseph M. Juran; Lloyd A. Knowler; Walter P. Koechel; Donald S. Leckie; Gayle W. McElrath; Carl E. Noble; Edwin G. Olds; Ellis R. Ott; Frank E. Satterthwaite; Leslie E. Simon; Frank W. Wehrfritz.

*New Book Reviews Editor*

Professor W. D. Baten, of Michigan State University, Lansing, Michigan, will serve the Society as Editor of the Book Reviews Department in IQC beginning July 1, 1956. Professor A. C. Cohen, Jr., who has handled the Book Reviews Department so faithfully since September 1949, has asked to be relieved of this assignment, but will continue to serve ASQC as a member of the Editorial Board.

For the Editorial Board
MASON E. WESCOTT,
Chairman

# National Officers

***President***
**Dale L. Lobsinger**
Superintendent
Management Controls
United Air Lines, Inc.
Denver, Colo.

***Vice President***
**Leon Bass**
Manager, Quality Control
Jet Engine Dept.
General Electric Co.
Cincinnati, Ohio

***Vice President***
**C. E. Fisher**
Quality Engineer
Bell Telephone Laboratories
New York, N. Y.

***Vice President***
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Chairman, Dept. of Math.
and App. Stat.
University College
Rutgers University
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***Vice President***
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Vice President
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Asst. to Director of Quality
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General Dynamics Corp.
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**Arthur Bender, Jr.**
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Delco-Remy Div.
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Anderson, Ind.

***Chairman, Editorial Board***
**Mason E. Wescott**
Prof. of App. Stat.
University College
Rutgers University
New Brunswick, N. J.

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Process Control & Inspection
American Steel & Wire Div.
U. S. Steel Corp.
Waukegan, Ill.

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Muncie, Ind.

**Clarence R. Burdick**
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**Paul S. Olmstead**
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Summers Gryoscope Co.
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**Stephen C. Bates**
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Cleveland, Ohio

**Brant Bonner**
Staff Supervisor
Statistical Quality Control
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University of Tennessee
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General Dynamics Corp.
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**Rocco L. Fiaschetti**
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Ansco-Gen. Aniline & Film Corp.
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**William P. Hammerly**
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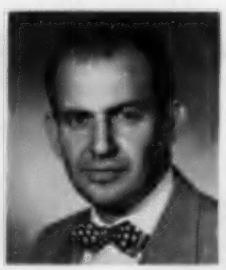
**Ralph D. Humphries**
Inspection Supervisor
Cessna Aircraft Co.
Wichita, Kans.

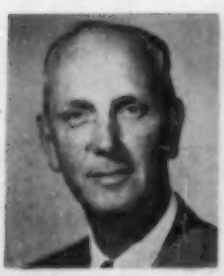
**Henry J. Jacobson**
Manager, Quality Control
P. R. Mallory Co.
Indianapolis, Ind.



**Norman Kravitz**
Schenley Distillers, Inc.
Cincinnati, Ohio

**August B. Mundel**
Director, Quality Control
Sonotone Corp.
Elmsford, N. Y.

**Warren R. Purcell**
Industrial Consultant
Rath & Strong, Inc.
Boston, Mass.



**W. Ralph Reeves**
Quality Control Supv.
RCA
Camden, N. J.

**Irvin W. Schoeninger**
Asst. Chf. Ceramic Eng.
Globe Union, Inc.
Milwaukee, Wis.

**Edward M. Schrock**
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American Radiator and
Standard Sanitary Corp.
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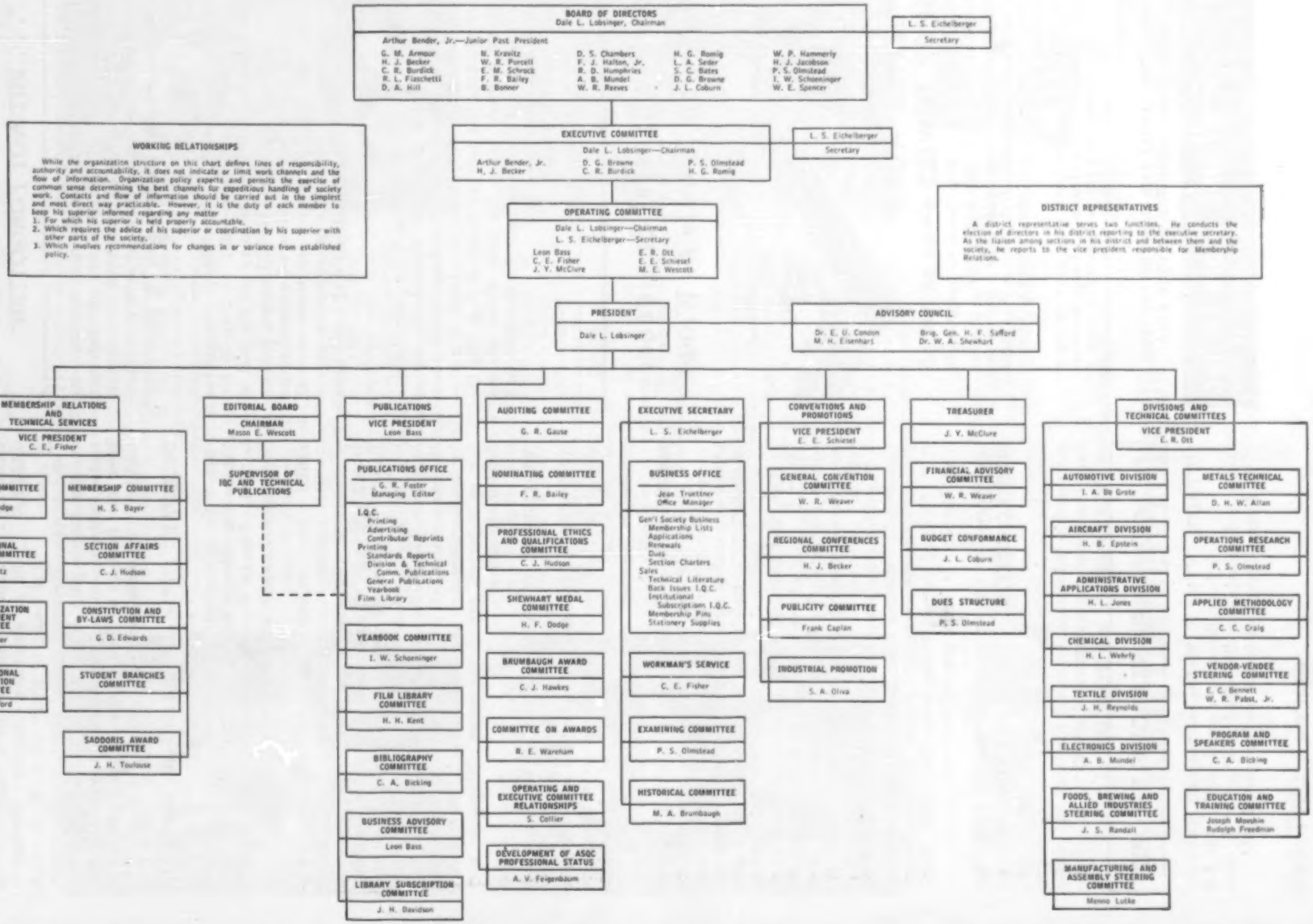
**Leonard A. Seder**
Quality Control Consultant
Malden, Mass.

**William E. Spencer**
Manager, Quality Control
Ball Brothers Co., Inc.
Muncie, Ind.

# American Society for Quality Control, Inc.
## Organization Chart for 1956-57


BOARD OF DIRECTORS
Dale L. Lobsinger, Chairman
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N. Kravitz, W. R. Purcell, E. M. Schrock, F. R. Bailey, B. Bonner
D. S. Chambers, F. J. Halton, Jr., R. D. Humphries, A. B. Mundel, W. R. Reeves
H. G. Romig, L. A. Seder, S. C. Bates, D. G. Browne, J. L. Coburn
W. P. Hammerly, H. J. Jacobson, P. S. Olmstead, I. W. Schoeninger, W. E. Spencer
L. S. Eichelberger
Secretary
WORKING RELATIONSHIPS
While the organization structure on this chart defines lines of responsibility, authority and accountability, it does not indicate or limit work channels and the flow of information. Organization policy expects and permits the exercise of common sense determining the best channels for expeditious handling of society work. Contacts and flow of information should be carried out in the simplest and most direct way practicable. However, it is the duty of each member to keep his superior informed regarding any matter
1. For which his superior is held properly accountable.
2. Which requires the advice of his superior or coordination by his superior with other parts of the society.
3. Which involves recommendations for changes in or variance from established policy.
EXECUTIVE COMMITTEE
Dale L. Lobsinger—Chairman
Arthur Bender, Jr., H. J. Becker
D. G. Browne, C. R. Burdick
P. S. Olmstead, H. G. Romig
L. S. Eichelberger
Secretary
OPERATING COMMITTEE
Dale L. Lobsinger—Chairman
L. S. Eichelberger—Secretary
Leon Bass, C. E. Fisher, J. Y. McClure
E. R. Ott, E. E. Schiesel, M. E. Wescott
DISTRICT REPRESENTATIVES
A district representative serves two functions. He conducts the election of directors in his district reporting to the executive secretary. As the liaison among sections in his district and between them and the society, he reports to the vice president responsible for Membership Relations.
PRESIDENT
Dale L. Lobsinger
ADVISORY COUNCIL
Dr. E. U. Condon, M. H. Eisenhart
Brig. Gen. H. F. Safford, Dr. W. A. Shewhart
MEMBERSHIP RELATIONS AND TECHNICAL SERVICES
VICE PRESIDENT
C. E. Fisher
STANDARDS COMMITTEE
H. F. Dodge
PROFESSIONAL RELATIONS COMMITTEE
N. Kravitz
ASQC ORGANIZATION DEVELOPMENT COMMITTEE
C. E. Fisher
INTERNATIONAL COOPERATION COMMITTEE
P. C. Clifford
MEMBERSHIP COMMITTEE
H. S. Bayer
SECTION AFFAIRS COMMITTEE
C. J. Hudson
CONSTITUTION AND BY-LAWS COMMITTEE
G. D. Edwards
STUDENT BRANCHES COMMITTEE
SADDORIS AWARD COMMITTEE
J. H. Toulouse
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Mason E. Wescott
SUPERVISOR OF IQC AND TECHNICAL PUBLICATIONS
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PUBLICATIONS OFFICE
G. R. Foster
Managing Editor
I.Q.C.
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Advertising
Contributor Reprints
Printing
Standards Reports
Division & Technical Comm. Publications
General Publications
Yearbook
Film Library
YEARBOOK COMMITTEE
I. W. Schoeninger
FILM LIBRARY COMMITTEE
H. H. Kent
BIBLIOGRAPHY COMMITTEE
C. A. Bicking
BUSINESS ADVISORY COMMITTEE
Leon Bass
LIBRARY SUBSCRIPTION COMMITTEE
J. H. Davidson
AUDITING COMMITTEE
G. R. Gause
NOMINATING COMMITTEE
F. R. Bailey
PROFESSIONAL ETHICS AND QUALIFICATIONS COMMITTEE
C. J. Hudson
SHEWHART MEDAL COMMITTEE
H. F. Dodge
BRUMBAUGH AWARD COMMITTEE
C. J. Hawkes
COMMITTEE ON AWARDS
R. E. Wareham
OPERATING AND EXECUTIVE COMMITTEE RELATIONSHIPS
S. Collier
DEVELOPMENT OF ASQC PROFESSIONAL STATUS
A. V. Feigenbaum
EXECUTIVE SECRETARY
L. S. Eichelberger
BUSINESS OFFICE
Jean Truettner
Office Manager
Gen'l Society Business
Membership Lists
Applications
Renewals
Dues
Section Charters
Sales
Technical Literature
Back Issues I.Q.C.
Institutional Subscriptions I.Q.C.
Membership Pins
Stationery Supplies
WORKMAN'S SERVICE
C. E. Fisher
EXAMINING COMMITTEE
P. S. Olmstead
HISTORICAL COMMITTEE
M. A. Brumbaugh
CONVENTIONS AND PROMOTIONS
VICE PRESIDENT
E. E. Schiesel
GENERAL CONVENTION COMMITTEE
W. R. Weaver
REGIONAL CONFERENCES COMMITTEE
H. J. Becker
PUBLICITY COMMITTEE
Frank Caplan
INDUSTRIAL PROMOTION
S. A. Oliva
TREASURER
J. Y. McClure
FINANCIAL ADVISORY COMMITTEE
W. R. Weaver
BUDGET CONFORMANCE
J. L. Coburn
DUES STRUCTURE
P. S. Olmstead
DIVISIONS AND TECHNICAL COMMITTEES
VICE PRESIDENT
E. R. Ott
AUTOMOTIVE DIVISION
I. A. De Grote
AIRCRAFT DIVISION
H. B. Epstein
ADMINISTRATIVE APPLICATIONS DIVISION
H. L. Jones
CHEMICAL DIVISION
H. L. Wehrly
TEXTILE DIVISION
J. H. Reynolds
ELECTRONICS DIVISION
A. B. Mundel
FOODS, BREWING AND ALLIED INDUSTRIES STEERING COMMITTEE
J. S. Randall
MANUFACTURING AND ASSEMBLY STEERING COMMITTEE
Menno Lutke
METALS TECHNICAL COMMITTEE
D. H. W. Allan
OPERATIONS RESEARCH COMMITTEE
P. S. Olmstead
APPLIED METHODOLOGY COMMITTEE
C. C. Craig
VENDOR-VENDEE STEERING COMMITTEE
E. C. Bennett
W. R. Pabst, Jr.
PROGRAM AND SPEAKERS COMMITTEE
C. A. Bicking
EDUCATION AND TRAINING COMMITTEE
Joseph Mawhin
Rudolph Freedman

# Local Section News

## ". . . BUT NOT FORGOTTEN"

**ALLENTOWN -BETHLEHEM** On July 9 a planning meeting was held at the residence of chairman Doug Adams. Attending were section officers and committee heads. Arrangements were made for an informal summer program, and fall plans were discussed.

**CHICAGO** The board of directors of the section held a dinner meeting on July 25 for review and discussion of plans to carry out the goal of "service to members" during the 1956-57 season. Policies regarding regular meetings, as well as educational series were agreed on. Suggestions and comments received from members as the result of a questionnaire survey made by the section were considered and acted upon as required.

**CINCINNATI** The first meeting of the 1956-57 executive committee showed the section should get off to a flying start. Committee reports show an active, interesting, educational year ahead. The program pre-planning has paid big dividends in getting the fall program outlined before the new officers are installed. A moonlight river excursion for members and their wives was enjoyed on July 8.


**Quality Control Engineers—**

***Put Shop Towels to Work!***

TEXEL *Service*

**"BETTER WORK" SHOP TOWELS** *always on the job!*

TEXEL Quality Slogan Shop Towels constantly remind employees that quality work is important.

Perfect for all-out 'Better Work' plant drives. Award silver dollars to workers if they know the "Better Work" slogan on the towel they happen to be using when you stop them.

TEXEL all-cotton shop towels save plant owners at least $2.50 on each 100 pounds of rags purchased . . . because they need not be replaced as often as rags. (Better work—and more of it—than an equal amount of rags.)

**WRITE FOR SAMPLE AND NAME OF THE TEXEL INDUSTRIAL LAUNDERER IN YOUR AREA**

**INDUSTRIAL WIPING CLOTH CO., INC.**
29-28 41st Ave., Long Island City 1, N. Y.


**CORNING -ELMIRA** Summer activities were kept simmering by an executive committee meeting at the home of chairman A. P. Stergion. The committee discussed special events for the winter, and the membership drive. A local file will be maintained on the education, experience and interest of members. This list will be used to pass on the eligibility of members for Senior and Fellow status.

**DELAWARE** The executive committee met on July 19 at the home of Joe Meyer, chairman of the arrangements committee. The program for the coming season is shaping up. The meeting place will be the Lord De La Warr Hotel where we have had excellent food and service and adequate facilities.

**ERIE** The new crop of officers held a business luncheon on August 1. They were briefed on the programs by chairman Dave Ferrell. Vice chairman Dick Albitz spoke of finances and of a membership drive. Dave Ferrell's review of the Saddoris Award point system prompted secretary Jim Orcutt to note that "membership buildup is the meat of this." Treasurer Clarence Haycox reported that several prospects have phoned him for applications—new members, hurrah! Renewals are just as important agreed the group. Meanwhile they feasted of course.

**HARRISBURG** The second monthly meeting of the executive committee was held at the Alcoa plant in Lancaster. All committee chairmen gave very progressive reports with the program committee already having an excellent schedule of able speakers for the coming year.

**MICHIGAN** The University of Michigan summer session and extension service with the co-operation of the Michigan section has recently completed a special program "Quality control by statistical methods." This training course, for executives and supervisory personnel, encompasses the techniques, objectives, and practical applications of quality control. Dr. C. C. Craig of the University of Michigan was the course director during the ten day series and was aided by several capable, industrial executives from the section.

The officers, directors, and committee chairmen of the section held a meeting July 26. The principal subject of discussion was the coming 11th Annual Michigan Forum. E. R. Clark of Detroit Transmission Div., GMC, Ypsilanti, Michigan is forum general chairman.

**WESTERN MASSACHUSETTS** Chairman Joseph Griffin has had informal individual meetings with all the various committee heads. Activity for the 1956-57 season relating to membership, education, technical meetings and clinics have been receiving concentrated attention.

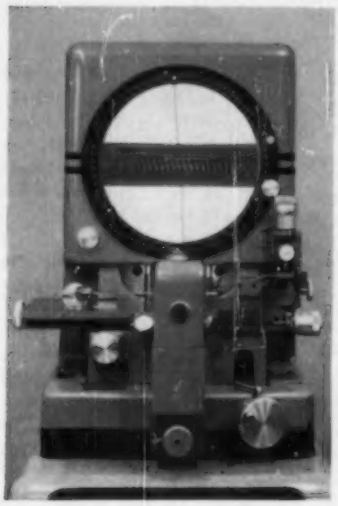
## ". . . CAST THEIR SHADOWS BEFORE"

**BUFFALO** Victor B. Shelburne, program chairman, is busy these days preparing for the fall season and promises a diversified program with some of the foremost speakers in the quality control field.

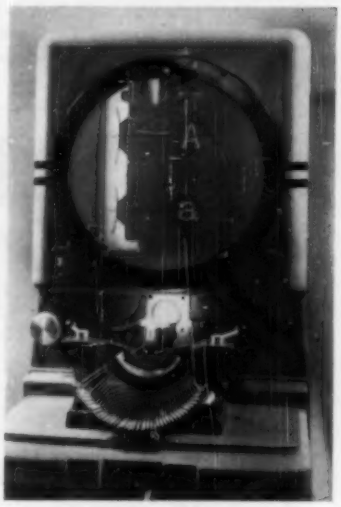
# How many places in your plant can projection gaging save time and money?

**In the toolroom?** Look at this. Prior to adopting projection gaging, a Midwestern manufacturing plant required 725 man-hours monthly to inspect flat drills, taps, special cutters, and circular form tools. Use of a Kodak Contour Projector reduced inspection time 84% to 115 man-hours; cost of the projector was returned in direct labor savings within three months. If you have a heavy inspection load in your toolroom, chances are that optical gaging with Kodak Contour Projectors could effect similar savings for you.

**In receiving?** Here's the experience of a leading maker of aircraft engines. Their gaging procedure on jet engine blades called for inspecting 11 dimensions (including radii and angles) on the dovetail contour, 14 additional dimensions on the blade root. Using two Kodak Contour Projectors, they checked these pieces at a rate of 150 per hour. And operators required little training. What about your receiving inspection department? Couldn't a fast, highly accurate method of inspecting all sorts of parts with multiple dimensions and complex shapes help prevent bottlenecks?



**In production?** A lot of people don't think of optical gaging in terms of production inspection. A typewriter maker did. To check the alignment of type bars to ±.0002", they placed a Kodak Contour Projector next to the soldering jigs on which bars are mounted on their arms. Catching errors at this point and correcting the jigs reduced alignment time in final assembly 25%. Install Kodak Contour Projectors next to production equipment and you have a fast, continuing check that insures machine settings are correct. That's a good way to keep scrap costs down and quality up.



**In final inspection?** Ever have a part that was almost impossible to inspect accurately and completely? A leading West Coast electronics manufacturer did. They had to check the precise pitch of a fine wire helix mounted in its glass tube. "Without the Kodak Contour Projector," the company reported, "it would not be practical to make the measurements necessary to get a satisfactory instrument." Many times optical gaging on a Kodak Contour Projector lets you measure small or easily distorted parts with a simplicity and accuracy you can't achieve by other methods.

WHATEVER your inspection or measuring problem, there's a Kodak Contour Projector to do the work, from the bench-type Model 8 to the big Model 30 with its 30-inch screen and large part capacity.

To find out more about how optical gaging can save you time and money, improve accuracy, send for the booklet, "Projection Gaging with Kodak Contour Projectors." Write *Special Products Sales Division.*

**EASTMAN KODAK COMPANY, Rochester 4, N. Y.**

**the KODAK CONTOUR PROJECTOR**

Kodak
TRADE-MARK

**CINCINNATI** The first fall meeting will be held on September 19 at the Engineering Society Building. Dinner at 6:30, coffee talk at 7:15, and at 8 pm Paul Robert, manager of quality control, The Gruen Watch Co., Cincinnati, will speak on "Quality control, a new tool of management."

**CORNING -ELMIRA** On October 17, Leo Jacobsen, a founding member of the Society, will speak to the section in Elmira on "Process capability considerations in product and process design." Mr. Jacobsen is chief engineer of the Philadelphia plant of the International Resistance Corp., and is well known as a lecturer on industrial statistics.

**DELAWARE** The first section meeting of the new season will be a repeat of last season's very successful "Ladies Night." The date is October 4 so make a date with your lady-fair and plan to come to an exceptionally good meeting. Detailed plans will be announced later.

**ERIE** Our first meeting of the new season tentatively will be a plant tour of a portion of the General Electric Erie Works. This may be a joint session with the Cleveland section. The committeeman in charge of this program still was vacationing at deadline time.

**GEORGIA** Tuesday, September 25 at 7:45 pm in Room 1833 Hurt Building, a talk on "Operations research—what it is and how it works" will be presented by Robert D. Roche, manager of systems evaluation projects, Military Operations Research Engineering Div., Lockheed Aircraft Corp., Marietta, Ga.

NEW!
Em-re
PRECISION
DIAL INDICATORS
THE MOST ACCURATE MADE
Some time ago, we recognized the need for a dial indicator with greater accuracy . . . So, using the finest tools, materials and workmanship that money could buy, we began building the "Em-re."
The result, a fully-jeweled, precision dial indicator that will consistently (after millions of checking operations) give repeated, accurate readings — surpassing A.G.D. tolerances. Furthermore, this is the only 100% shockproof mechanism on the market . . . Stocked in 24 models having 6 ranges from .025" to .250" with graduations in .00005", .0001", .00025", .0005" and .001".
Now—we suggest you do three things:
(1) send for Bulletin 455-B
(2) purchase a sample for your gage man to check
(3) compare it with any brand you are using . . . and send us an order.
Patents Pending.
PETZ-EMERY INC.
PLEASANT VALLEY, NEW YORK


Tuesday, October 30 at 7:45 pm in Room 1833 of the Hurt Building, a talk on "Programming the quality control engineering job," will be presented by William J. Masser, manager of quality control engineering service, General Electric Co., Schenectady, N. Y.

**HARRISBURG** The first meeting of the 1956-57 year for the section will be held at the RCA plant in Lancaster, Pa. A tour of their fine plant, including the color TV-sections, will be held prior to the dinner meeting. We are fortunate in obtaining as our first speaker, G. R. Scheel, chief inspector of the White Plains, N.Y. plant of the Sonotone Corp. His topic "Control of solder joint quality" is sure to be interesting and of value to many of us.

**KANSAS CITY** The section will hold their October meeting on Wednesday the 10th. The dinner meeting at the Blue Hills Restaurant will be preceded by a seminar starting at 5:30. The seminar which is to cover statistical quality control and inspection techniques is to be directed by the educational chairman, Orriss Stewart.

**LOUISVILLE** Those members who could not attend the Montreal Convention will be privileged on October 8 to hear R. L. Gruenwald deliver the same talk that was so well received at Montreal—the subject being "Improving quality control through personnel performance appraisals." Mr. Gruenwald is manager of the component and overhaul section of the General Electric Co.'s Cincinnati plant, manufacturers of jet engines.

**MUNCIE** Our section made a nice trade. We traded our usual Thursday meeting date for Friday in order to secure the noteworthy services of Leon Bass who will open our season's program with an address Friday evening, September 21 in the Pine Shelf Room of the Pittenger Student Center. Dinner will be served at 6:30 and the meeting will be held at 7:30.

Thursday, October 18 will see us return to our usual Thursday schedule with our regular 7:30 meeting in the Pine Shelf Room of the Pittenger Student Center preceded by a dinner meeting at 6:30.

**NORTHEASTERN INDIANA** The section will open the new year on the second Thursday of October with James M. Barrabee, general foreman, foundry inspection, construction equipment division, International Harvester Co., Milwaukee Works, speaking on "Quality control in heavy industry." The truck division, Fort Wayne Works, will sponsor the night as "International Harvester Night" with Raymond N. Snyder, quality control manager, as host.

**WESTERN MASSACHUSETTS** The section is not scheduling a regular meeting for the month of October as it is to be host to the Tenth New England Quality Control Conference to be held in Springfield, at the Sheraton-Kimball Hotel.

## "AS YE SOW . . ."

**ALBUQUERQUE** The section in co-operation with the University of New Mexico will sponsor a course in statistical quality control in the University's evening adult education program for 1956-

57. Basic statistics will be covered in the fall term, followed by an advanced course in the spring session.

Classes will be held on Wednesday evenings, 7 to 9 pm, in Room 120 of Mitchell Hall. The 12 sessions of the fall term will start September 19 and end December 13 (Thanksgiving week excepted). Fee for the term is $12.00.

The basic subjects of the fall term will be taught by J. L. Williams and A. S. Hayes, both of Sandia Corporation. These subjects will include frequency distributions and their analysis, the derivation and significance of standard deviation (sigma), controls charts ($\bar{X}$ and R), p and c charts, correlation, and acceptance sampling by attributes.

Mr. Williams graduated from the University of Missouri with a BS (Eng) degree in 1941. His experience in quality control work includes management of the quality control programs at the Hamilton Manufacturing Co., Two Rivers, Wisconsin and the Rocky Mountain Arsenal in Denver. He has attended advanced courses in applied quality control at Northwestern University and Rutgers.

Mr. Hayes attended the University of Wisconsin graduating in 1936 with a BS (Eng) degree. His experience includes direction of the quality control program for the Perfect Circle Corp., Hagerstown, Ind. He has attended special courses in applied quality control at Marquette University and Rutgers.

**CHICAGO** The section will again present its advanced educational program on 16 consecutive Tuesday evenings, starting September 25. Dr. Youden's fine textbook, *Statistical Methods for Chemists*, will be used as the framework for guidance and reference for the college level presentations offered at the Wahl-Henius Institute classroom. Many experienced quality control practitioners will contribute pertinent case histories to this well-organized program. Continental Can Company's Mae Goodwin Tarver will be in charge.

**CINCINNATI** The fall educational series will start on October 8 and run for seven weeks. Instructors have been selected and course material prepared. The series is open to the public.

The January Conference planning is under way, with the all-day meeting set for January 26, 1957.

**COLUMBUS** An advanced training course on "Acceptance Sampling" will be presented this fall. The course will review some fundamental concepts in acceptance sampling followed by a study of cost factors involved. Some time will be spent on sampling by attributes but most of the sessions will be devoted to acceptance sampling by variables.

Dr. Max Astrachan of the United States Armed Forces Institute, Wright-Patterson Air Force Base, is the course instructor. Dr. Astrachan has previously addressed the section on three occasions and is well known for his ability to bring a clear understanding of his subject to those he teaches.

The classes will be conducted on Tuesday nights, every other week, for a total of six class periods or 12 hours, starting on October 2. The time is tentatively set for 7 pm and the location of the class room will be Westinghouse Electric Appliance Plant, 30 Philipi Road, Columbus, Ohio.

Maximum enrollment for the course is 25. A fee of $25 has been established to cover all materials and text book, plus instructor expenses.

**DELAWARE** The educational clinic of the section for the coming season will be a series of actual case histories presented by different members of the section. Watch for later announcements in more detail.

**HARRISBURG** Both basic and advanced courses in quality control will again be offered this coming year by the Harrisburg section. Classes will probably begin the week of October 15. Last year the courses were offered in only one of our cities. This year, however, the committee is considering giving the courses in Harrisburg and Lancaster as well as York, if the interest warrants.

**LOUISVILLE** Since the capsule education offered at many meetings last year illustrated the solving of local industrial problems so well these fifteen minute talks are to be continued this year. Burr Stanton, education committee chairman, has the two short courses—the one on quality control and data analysis and the other on basic methods scheduled to be held at General Electric Co.

**MICHIGAN** Edward R. Clark, Detroit Transmission Div., GMC, is forum chairman this year. The activity tempo is rising to a higher-than-usual pitch as the Michigan section prepares for its Eleventh Annual Forum that will be held at the University of Michigan in Ann Arbor, Mich. Saturday, September 8 will be the big day. Many well known speakers and educators will take part in presenting the concepts of quality control. These include: R. W. Gardner, Ford Motor Co., Michigan; C. E. Noble, Kimberly-Clark Corp., Wisconsin; W. R. Purcell, Rath & Strong,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**MINNESOTA** The 11th Midwest Quality Control Conference will be held in Minneapolis on October 11-12. Chairman Gayle McElrath's committee has prepared an appealing program including an elementary training program conducted by these nationally known educators: Professors N. H. Barnard, I. W. Burr, and J. A. Henry. "What's new in quality control" will serve as the theme for the fifteen technical sessions which will be offered concurrently with the training program. For further information write: Robert F. Tuve, 2115 East River Road, Minneapolis 14, Minn.

**ST. LOUIS** ASQC President Dale L. Lobsinger, United Airlines, will speak on "Quality control and the people it influences" at the morning technical session of the one-day conference scheduled for September 27.

Registration for the conference will be from 9-9:45 am at Garavelli's, 301 DeBaliviere.

**STATE UNIVERSITY OF IOWA** The fifteenth intensive full-time training course in quality control by statistical methods is scheduled by the State University of Iowa at Iowa City, Iowa, Oct. 16-26. This will be an introductory course which will follow the same general pattern of the previous basic courses.

A special session for executives is scheduled for the first day, Tuesday, Oct. 16. It will be devoted to an explanation of the aims and the possibilities of a quality control program and to outlining a procedure for the installation of such a program in the plants.

Instruction will be by lecture, demonstration, laboratory work, and evening question and problem discussion sessions, with the emphasis on practical interpretation throughout.

The fee of $100 per person includes text material, manuals, booklets, supplies, and university participation in the two 2-day follow-up clinics. Trainees will be expected to provide for their own transportation and living expenses. Room accommodations are available at the Jefferson Hotel in Iowa City. Make room reservations directly with the hotel.

Further inquiries concerning this course should be addressed to Prof. Lloyd A. Knowler, Chairman, Department of Mathematics and Astronomy, State University of Iowa, Iowa City, Iowa.

**WESTERN MASSACHUSETTS** The educational program for this section has been delayed so that it will not get started until the last week of September or the first week of October. Carl Bauman of Monsanto, chairman of education, will make a formal announcement to members and a newspaper release will be made announcing the exact time. It is to be in conjunction with the University of Massachusetts Extension and will be with advanced statistics as related to decision making.

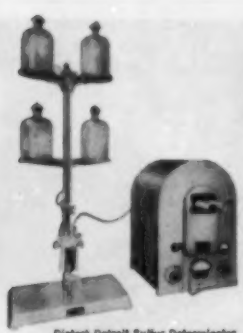
**11TH MIDWEST QC CONFERENCE OCTOBER 11-12** "What's new in Quality Control?" This is the theme of the 11th Midwest Conference to be held at the Leamington Hotel in Minneapolis October 11 and 12.

Quality control and automation, research strategy, linear programming, and the adjustment of production to sales are several of the topics to be discussed in a program planned with emphasis on recent developments in quality control techniques. Sessions will be presented by Dr. Carl A. Bennett, Hanford Atomic Works; Dr. William J. Youden, National Bureau of Standards; Dr. H. C. Batson, Illinois Department of Public Health, as well as 12 other prominent speakers whose subjects will be equally diversified and interesting.

Dr. John B. Oman will speak to the general assembly at 9:30 am on Thursday, October 11. Dr. Oman received degrees from Temple University, Philadelphia, Pa., and the Lutheran Theological Seminary, Philadelphia, Pa., where he wrote his thesis in penology and abnormal psychology.

Dr. J. O. Christianson will be the luncheon speaker on Friday, October 12. Dr. Christianson received degrees from the University of Minnesota, University of North Dakota, and in June 1950 was awarded the degree of Doctor of Humane Letters by Gustavus Adolphus College, St. Peter, Minn. Currently Dr. Christianson is superintendent of the School of Agriculture, St. Paul, Minn., and director of the agricultural short courses at the University of Minnesota.

An elementary training course will also be presented and will be of particular interest to foremen and supervisors. This course will be conducted by three nationally known educators: Professor N. H. Barnard, Chairman of the Department of Mechanical Engineering at the University of Nebraska; Professor I. W. Burr, Depart-

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ment of Mathematics, Purdue University; and Professor J. A. Henry, Department of Mechanical Engineering at the University of Illinois.

Brochures containing complete details and a registration form are being sent to all members of the Midwest Conference and to all other ASQC Sections.

Richard J. Keefe, 2620 McNair Drive, Minneapolis 22, Minn. will furnish any additional information, and all inquiries should be addressed to him.

**BOX METHOD OF EXPERIMENTATION**

The Chemical Division will sponsor a repeat course in the Box method of experimentation at the University of Michigan, Ann Arbor, Michigan, October 8-10. Course outline will be the same as for the course given at the Harvard Business School in May of this year and instruction will again be in charge of Dr. J. S. Hunter of the American Cyanamid Company.

Because of the requirements of a course of this type, enrollment is necessarily limited and has already been filled from among the people whose applications for the May course were received after the May course enrollment had been filled. Efforts are now being made to arrange a second repeat course to be given at a later date. For further information write to D. H. Davis, General Foods Corp., Battle Creek, Mich.

**QC COURSE MICHIGAN STATE UNIVERSITY**

A course on quality control by statistical methods is being offered by the evening division of Michigan State University. The classes, 7:30-9:30 pm on Tuesday and Thursday evenings, will begin on Tuesday, September 18, and continue for ten consecutive weeks.

The cost of the course including a text book will be $40.00, to be paid upon registering for the course.

Professor W. D. Baten, who has offered this course in industries and several times at Michigan State University, will be the course instructor. For information write Continuing Education Service, Michigan State University, Room 6, Kellogg Center, East Lansing, Mich.

**INDUSTRIAL MANAGEMENT SOCIETY, OCTOBER 31, NOVEMBER 1-2**

America's Dr. Lillian Gilbreth, so-called "mother" of motion study, and England's Anne G. Shaw, consultant to leading British industries, will discuss "Industrial engineering: USA and England" at the Thursday evening banquet which will headline the 20th Anniversary Time and Motion Study and Management Clinic sponsored by the Industrial Management Society. More than 2,000 works managers, production executives, and industrial engineers from all parts of the country are expected to attend the three-day clinic which will be held at the Hotel Sherman, Chicago, on October 31, November 1 and 2.

**PRODUCTION MANAGEMENT COURSES NEW YORK UNIVERSITY**

Eight adult courses in production management will be offered during the 1956 fall semester at New York University's Division of General Education. The courses will be conducted during the evening hours by instructors drawn from the executive ranks of industry and engineering. The courses and nights they will be conducted are: time study—Monday; package engineering (protective techniques and cost reduction studies)—Tuesday; engineering manufacturing processes—Wednesday; advanced engineering manufacturing processes—Wednesday; tool design—Wednesday; abrasive applications, plant planning and layout—Thursday; quality control—Friday.

Interested persons may register from September 10-28 either by person or through the mail. Further information may be obtained at the Division of General Education, New York University, 1 Washington Square North, New York 3, N. Y.

**TENTH NEW ENGLAND QC CONFERENCE OCTOBER 3-5**

A Get-to-gether kicks off the Tenth Anniversary Conference of the New England Sections on the evening of October 3 at the Conference headquarters in the Hotel Sheraton-Kimball in Springfield, Massachusetts.

On Thursday, October 4 at 9 am Warren Purcell of Rath and Strong, Inc., Boston, Mass., delivers the keynote address which has a background of the conference theme "Celebrating a decade of quality progress." At 10:15 am a two-day program of seminars and clinics gets under way.

The seminar schedule features reliability management, non-inspection statistical applications and quality control management. The clinic sessions feature many papers on such modern topics as "Source radiography" and "Application of digital techniques to automatic control."

The banquet speaker on Thursday, October 4, is Mr. Foster W. Doty, Chairman of the Board of Directors, Union Trust Company, Springfield, Mass. A graduate of the Wharton School of Finance and Commerce, University of Pennsylvania and a veteran of World War I, he has an outstanding record of service to the community. His message will be one of inspiration to all participants.


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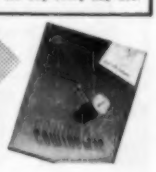

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The conference is well rounded out with plant visits, exhibits and an outstanding ladies program covering many feminine interests. A special event this year includes a "technical" session for the ladies conducted by "Charlie" Hudson.

Copies of program and registration form may be obtained by writing to Martin W. Rogers, Registrar, c/o National Company, Inc., Malden, Mass.

## "FOR MANY ARE CALLED, BUT FEW ARE . . ."

**CINCINNATI** The officers for the year 1956-57 are: H. D. Birch, chairman, The General Electric Co.; R. J. Fopma, vice chairman, University of Cincinnati; W. E. Barker, secretary, The General Electric Co.; J. L. Mairose, treasurer, the Drackett Chemical Co.

**KANSAS CITY** Michael L. Blessing of Black Sivalls & Bryson was elected the new vice chairman. He replaces Fred W. Rohde who recently moved to Pittsburgh, Pa.

**RHODE ISLAND** Chairman Charles Maxwell tendered his resigation to take another position with the Coats and Clark Co. in New Jersey. The section's executive committee has appointed vice chairman William P. Hammerly to the office of chairman. Mr. Hammerly, in his position as chairman appointed John Hird of Taco Heaters Co., Providence, as the 1956-57 vice chairman.

**WASHINGTON** The officers for the coming season are: chairman—E. T. Magruder, Chesapeake & Potomac Telephone Co.; vice chairman—Courtland C. Van Vechten, Bureau of Ordnance, Department of the Navy; secretary—Beatrice Orleans, Bureau of Ships, Department of the Navy; treasurer—Harvey L. Levin, Office, Chief of Ordnance, Department of the Army.

**NEW JERSEY PHARMACEUTICAL QC GROUP ELECTS** The Pharmaceutical Quality Control Group of New Jersey has elected the following members to serve for the year ending March, 1957; chairman—Herbert I. Mitchell; chairman elect—Raymond L. Thatcher; secretary-treasurer—Joseph W. Kouten.

The group, consisting of 30 members representing 27 pharmaceutical manufacturers in New Jersey and adjacent areas, organized two years ago and has held monthly discussion meetings during the past two years.

The objective of the group is to foster a free exchange of ideas, expressions and discussion on problems involving administration of quality control in the pharmaceutical industry.

## DIVISIONS

### *Chemical Division*

The Chemical Division Council will meet in Ann Arbor, Michigan, on September 7-8 in conjunction with the Eleventh Annual Michigan Forum which is being held on the 8th. This council meeting is being held to discuss plans for the coming year.

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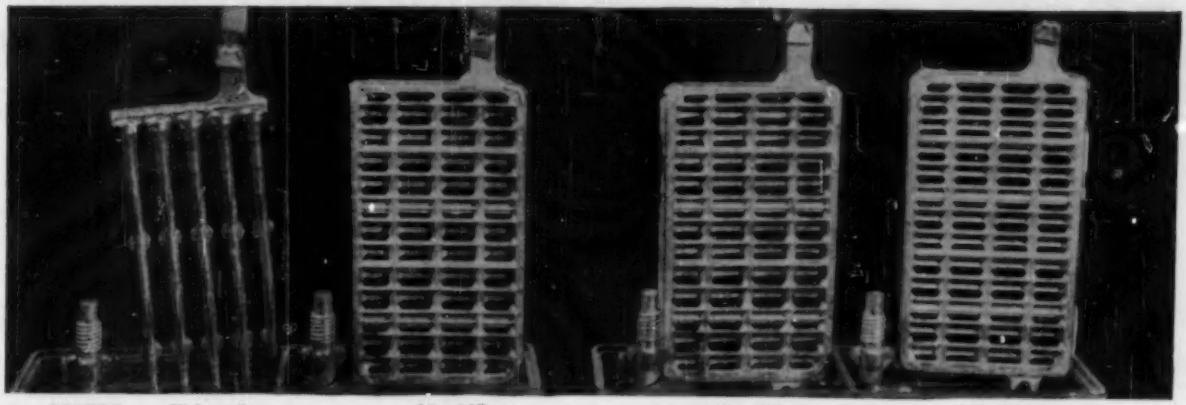
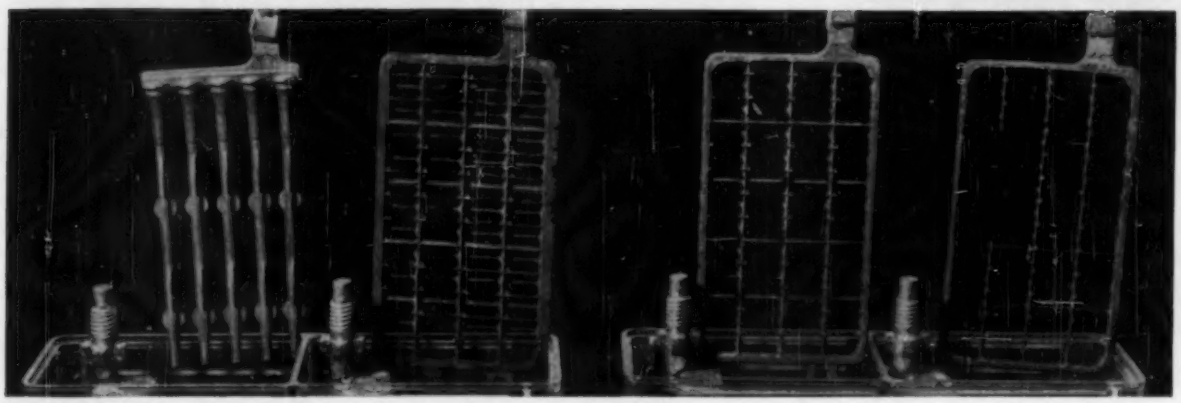


**BEFORE:** Silvium alloy — Alloy "A" — Alloy "B" — Alloy "C"



**AFTER:** Note how the Silvium grid resisted corrosion. Compare it with the other alloys.

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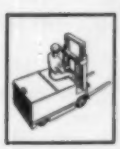

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Silvium is a special alloy developed by Exide to resist corrosion and thus prolong battery life. For proof, Exide research engineers compared the performance of an Ironclad Silvium grid side by side with ordinary grids of other lead alloys. As the photographs above show, only Silvium came through the test without damaging corrosion—undiminished in size, unimpaired in strength. The other grids showed from moderate to severe corrosion.

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The following councilors have been elected to serve for the 1956-57 year: district 1—John D. Hinchen; district 2—Victor B. Shellburne; district 3—James Eldridge; district 4—Ben H. Lloyd; district 6—Emil G. Wiest; district 8—B. H. Carpenter; district 10—E. F. Schultz; district 11—James R. Mallen; district 12—Otto A. Kral; district 13—Paul K. Leatherman; district 14—C. T. Shewell; district 15—Miles E. Duellman; district 16—E. A. Elkins.

The division will actively participate in the Middle Atlantic Conference to be held in Philadephia on February 15-16, 1957. J. Fred Verigan of Crown Cork and Seal Co. is the division representative for the conference.

## MEMBERSHIP CORNER

The Birmingham Section, 1956 winner of the Saddoris Award for Section Management, also placed third in the special Tenth Anniversary Year Membership Committee Award. The following excerpts from the fine membership activity report submitted as part of this competition offer an excellent pattern for all sections in planning their membership activity.

### *Development of Attractive Program*

The first step in attaining the membership quota objective was taken with a view to stimulating membership by an active, interesting and informative program. A comprehensive list of possible speakers was prepared and mailing of speaking invitations was commenced on April 26. A conference was held June 30, 1955, with members of the University of Alabama faculty relative to a joint one-day clinic or conference.

In September, the complete program for the year was finished and included two jointly sponsored one-day clinics or conferences, a picnic social, a visit to a Birmingham plant and a dinner speaker for every month from September, 1955, through May, 1956.

### *Membership Canvassing*

Once the year's program was completed, a mail campaign for new members was initiated. When completed, over 500 solicitations for membership had been mailed to industries of Northern Alabama. Another letter was sent out to former students in quality control courses. A third letter was sent to former members and to guests at past dinner meetings. A fourth letter was sent to anyone who had inquired or expressed an interest in statistical quality control. ACCOMPANYING EACH OF THESE LETTERS WAS A COPY OF THE PRINTED PROGRAM OF THE BIRMINGHAM SECTION FOR THE YEAR 1955-56, a copy of a folder describing ASQC and its functions, and a membership application blank.

### *Educational Efforts*

Educational courses in statistical quality control were conducted in collaboration with the University of Alabama with a view of not only disseminating knowledge concerning quality control but also with the hope of obtaining new members from the students. Several of this year's new members have been obtained from graduates of such courses.

### *Publicity*

An active program was maintained throughout the year to keep the activities of the Birmingham section before the public by means of continuing newspaper and radio announcements. Publicity know-how increased as the year progressed. In September, 1955, the regular monthly dinner meeting was covered by only two clippings, whereas, in January, 1956, there was a coverage of 14 clippings and nine radio announcements. THE APPEAL OF HELPING BIRMINGHAM TO WIN THE NATIONAL AWARD AND RECEIVE NATIONAL PUBLICITY WAS HELPFUL IN GETTING THE CO-OPERATION OF PUBLICITY MEDIUMS.

### *Saddoris Award Competition*

In an effort to increase Section pride and morale with a view to developing that contagious type of enthusiasm among members that would be instrumental in bringing in new members, the Birmingham Section has made a continuing effort to stand high in the Saddoris Award Competition. ANNOUNCEMENTS OF OUR STANDING IN THE COMPETITION HAVE BEEN MADE AT EVERY MEETING AND HAS CERTAINLY INCREASED THE PRESTIGE OF THE BIRMINGHAM SECTION IN THE OPINION OF GUESTS.

Many ideas for the letters used were taken from the membership manual. Your national membership committee urges each section to make use of this manual as an aid to effective Section management. (Lost copies may be replaced by request to Harmon S. Bayer, 1154 Book Bldg., Detroit, Mich.)

## SIGNIFICANT DIFFERENCES

The Buffalo section welcomes General Leslie E. Simon (ret.) who recently transferred from the Washington, D. C. section. General Simon is director of the research and development division for the Carborundum Company. Prior to the present position, General Simon was assistant chief of ordnance for research and development.

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Frank Caplan, senior member of the Cincinnati section, has left the General Electric Company and accepted a position as quality control manager with the new Atomic Fuel Division of the Westinghouse Electric Co., Pittsburgh, Pa.

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Henry Levin, Cincinnati section member, has accepted a position with Park and Tilford Distillery in Louisville, Ky. as plant chemist.

---

Robert L. Myers, formerly a quality control engineer at the Elmira plant of the Westinghouse Electronic Tube Div., has been recently promoted to plant supervisor of quality control in the same plant. Mr. Myers is a member of the Corning-Elmira section.

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Habib Labbauf, member-in-training of the Baton Rouge-New Orleans section, has recently joined the staff of the Whiting Research Laboratories of the Standard Oil Company (Indiana).

---

W. E. Andrus, Jr., past chairman of the Binghamton section, was recently appointed manager of IBM's Endicott Scientific Computation Laboratory. This is a service group offering mathematical and statistical consulting and computation services to IBM's engineering organization. Mr. Andrus had previously been staff mathematician in charge of the statistical section of the Scientific Computation Laboratory.

Fred W. Rohde, formerly of the AGT Division of Westinghouse Electric Co., Kansas City, has been transferred to the headquarters division at Pittsburgh, Pa. Mr. Rohde has been appointed Director of Quality Control of the Plant Apparatus Department.

---

T. W. Bayler of Continental Aviation Div. of Continental Motors was recently promoted to chief inspector. Mr. Bayler's new responsibility will involve gas turbine engine assembly and overhaul, a function that will include both the Detroit and the Toledo plants. Mr. Bayler is a senior member of the Michigan section.

---

Joseph Griffin, Western Massachusetts section chairman, received a promotion on his job which now makes him head of all quality control activity of the Westinghouse East Springfield Works.

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Brant Bonner, secretary of the Chemical Division and senior member of the Western Ontario section, has been appointed staff supervisor of statistical quality control with The Dow Chemical Co., Midland, Mich.

---

W. H. Horton, Pittsburgh section member, has been promoted to manager of the experimental design and statistical analysis section of the materials engineering department of the Westinghouse Electric Corp. He had formerly been a statistician with the Naval Engineering Experimental station at Annapolis, Md.

---

Richard S. Bingham, Jr. has resigned his position as quality control engineer for Atlas Powder Co., Volunteer Ordnance Works, to accept a position in the research and development division of The Carborundum Co., Niagara Falls, N. Y. Dick was a very active member of the Chattanooga section, serving as a member of the forming committee for the Chattanooga subsection of the Tennessee section and as chairman of the Chattanooga section during its first year.

# What's New?

ROY A. WYLIE, *Editor*

*When inquiring about "What's New?" items, please mention INDUSTRIAL QUALITY CONTROL*

**Brush Electronics Co.**, 3405 Perkins Avenue, Cleveland 14, Ohio, has announced that it has again put its "laboratory on wheels" on the road. This year, the station wagon will again feature field demonstrations of the newest instruments for sound and vibration measurement. In addition, for the first time will be displayed a new line of Brush instruments used for strain measurement. Actual demonstrations will be made according to a company's own operating needs at their plant sites. All visits will be made by scheduled appointment only. Additional information on equipment to be displayed plus the route of the traveling display may be obtained from Brush Electronics Company.

★ ★ ★

**Allegany Instrument Co., Inc.**, 1091 Wills Mountain, Cumberland, Md. have introduced a Model 12 Automatic Bleach Control for evaluation of the effects of the bleaching agents in the bleaching stages of pulp making. Model 12 can be used both as a recording device and a control device. When employed as a recorder, it provides a record of reflection variation over a 24-hour period. As a control, it provides this record and automatically regulates the feed of bleaching agents to one or more bleaching stages in accordance with and in response to photoelectrically determined brightness characteristics of the pulp. With records thus obtained, along with records of other variables, any given set of operating conditions producing a favorable result can be re-established whenever desired. Recording and controlling is automatic and continuous. Although the Model 12 Automatic Bleach Control is used to record and control the bleaching of paper pulp, variations of this instrument can be used in any phase of a manufacturing process in which something is done to change the brightness of the manufactured material. This process can be anything from the manufacture of cake flour to the bleaching of pulp.

★ ★ ★

**Boice Gages Inc.**, Staatsburg, N. Y., has added a new small diameter bore gage to its line of precision dial indicator gages. The new gage is adjustable for any hole size from ¼ to ½ inch diameter. Fixed pin equalizers insure centralization in any hole within its capacity, and only three range extensions are required for the ¼ inch of range adjustment. No adapters are needed. Weight of the gage is only four ounces. Included with the gage is a small leather pouch which attaches to the operator's apron. This encourages constant use leading to better inspection results.

★ ★ ★

Reusable slates designed to eliminate all calculations now required for control charts or variable sampling inspection have been made available by **C & E Engineers**, 7014 El Cedral St., Long Beach 15, Calif. The film lift type slates are available with preprinted formats. Stock items available are 8½ x 13 inch probability graph, blank and other formats as requested. Additions or alterations on the plastic surface of the slate are possible through the use of special ink supplied with each slate. The ink itself is removable. In practice a series of readings for a point on a control chart are taken and entered in a space provided on the probability graph slate. The readings are ranked and plotted on the graph. NO-Cal Lot Plot theory is used to determine the correct abscissa for each reading. A line is then drawn through the points. Intersections of the line with the 50 percent and 84 percent lines are used to estimate

the average and standard deviation. The average and standard deviation are then transferred to a second "Control Chart" slate. At the end of the shift or other recording period the films can be lifted, restoring the slates to their original condition. The probability graph slate can also be used directly to estimate percentage yields for acceptance of product by variables inspection or in the analysis of engineering or other test data. Slates are supplied in a kit containing one slate ruled as a probability graph, special ink and instruction booklet. Price is $3.00.

★ ★ ★

A newly developed low-cost grating type scanning spectrometer is now in production at the laboratories of the **Jarrell-Ash Co.**, 26 Farwell St., Newtonville 60, Mass. The optical design results in a first order reciprocal linear dispersion of 16 Angstroms/mm at the exit slit, with a minimum resolution of 0.2 Angstroms. Easily adapted for use as a flame spectrometer capable of detecting impurities to one part per billion, the new model 8200 JAco-Ebert 0.5 meter Scanning Spectrometer is ideal for a wide range of research studies including analyses of petroleum products for additives, catalysts, derivatives, detection of wear metals in lubricating oils; analyses of boiler feed water, plating solutions, fertilizers, biological and pharmaceutical materials, foods, and many other trace element determinations. One of the features incorporated into the model 8200 is a linear wave length scanning mechanism which requires only a simple Veeder-Root counter to indicate first order wavelength. A built-in eight speed motor drive permits variable speed scanning in either direction with manual drive also provided. The spectrometer serves as an excellent source of narrow band-pass high intensity nonchromatic light and is well suited for investigations of band structure from various sources, isotope abundance ratios, plus studies of spectral energy distribution. The unit measures 18 inches long and weighs approximately 20 lbs. It is also available with a choice of two electronic systems for either direct recording of spectral intensities or for absorption studies. The first is a high sensitivity system for plotting absolute intensity against wavelength, using a strip chart recorder. The second system is used for ratio recordings where the ratio of the total source intensity relative to the spectral intensity, is plotted on a strip chart recorder. This latter system is desirable for sources which fluctuate widely with respect to time.

★ ★ ★

A precision decade three-terminal standard capacitor, with accuracy of 0.2 percent has been introduced by the **Federal Telephone and Radio Co.**, 100 Kingsland Rd., Clifton, N. J. The type FT-KGM is used as a laboratory standard for calibration of capacitance bridges and meters, for development and laboratory testing of integrators, computers and low-level a.c. amplifiers and for a variety of circuit measurements or for use

# BOOK REVIEWS

## *W. D. Baten, Editor*

QUALITY CONTROL AND APPLIED STATISTICS, Abstract Service; editors: Robert S. Titchen, Arnold J. Rosenthal, Bruce Bollerman, Frank Nistico; published by Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y.; Volume 1, Issue 1.; reviewed by Harmon S. Bayer.

This issue initiates an abstracting service in the field of quality control and applied statistics. The editors have projected a rather complete and ambitious service. Over 400 journals will be scanned for these abstracts. The abstracts are detailed, sometimes two or three pages in length, containing what the abstractor deems are the significant conclusions, formulae, graphs, etc. According to the editor's statement, the abstracts are designed "so that it will usually not be necessary to consult the original paper." This claim may be debatable, although the abstracts are, in fact, what the authors described them to be—rather detailed. Nevertheless it seems likely that these abstracts will, like any others, serve the function of helping the searcher determine what paper will help him on a particular problem. It would seem that the careful worker would have to seek the original paper before effective application of the principles of the paper might be made. The abstracts are published on loose-leaf paper. They are numbered to fit into an excellent classification and filing system developed by the authors so that the users can file each paper according to a subject indexing system. Author and subject indices will be published annually. The brochure outlines plans to publish twelve issues annually at a cost of $60.00 per year.

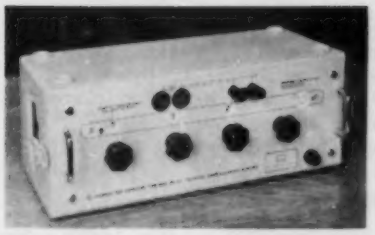
**Editorial Note**

*As of July 1, 1956, the Book Review Department is under the editorship of Professor W. D. Baten, Michigan State University, who succeeds Professor A. C. Cohen, Jr., University of Georgia. Dr. Cohen was Book Review Editor for this journal from 1949-1956. His long and faithful service to IQC readers in this capacity is acknowledged with sincere appreciation by the Editorial Board and officers of ASQC. Professor Cohen will continue to serve the Society as a member of its Editorial Board.*

*M. E. Westcott, Chairman*
*Editorial Board, ASQC*

MODERN MILL CONTROLS; by N. L. Enrick; a modern textiles magazine handbook, published by Modern Textiles Magazine and Rayon Publishing Corp., 303 Fifth Avenue, New York 16, N.Y.; reviewed by Harmon S. Bayer.

This pamphlet, consisting of 28 pages, covers the organization and methods for the control of quality and costs in a textile mill. Considerable detail is spent on organization, function, specific forms, calculations, laboratory procedures, clerical procedures and methods in each department related to the control function. The subjects not only include the field of statistical quality control but they cover many other facets of the organization which affect quality and costs; e.g., Preventive Maintenance. Companies other than textiles (chemicals, for instance) might take note of the author's approach to the relationship of statistical quality control and the control laboratory function.



as a component in laboratory constructed circuits such as bridges. The three terminals permit the unit to be used as a grounded or ungrounded component as desired. The double shielding may be interconnected. The capacitor's high resonant frequency (approximately 0.35 to 11 mc depending on the capacitance switched in) allows the unit to be used over a wide frequency range. Total capacitance range of the unit extends from 100 uuf to 1.11 uf. Settings of the instrument are made on three decade scales and one continuously variable air capacitor scale. Each decade knob controls four capacitors by means of 11-step switches that permit values of 1 to 10 to be obtained for each knob. The value set at each decade appears in a window above the adjusting knob. The windows are arranged in a horizontal line so that the result appears in easily readable digital form. The unit weighs 22 lbs. and is 9 inches high, 9 inches deep, and 12½ inches wide.

★ ★ ★

**Tinius Olsen Testing Machine Co.,** 6122 Easton Rd., Willow Grove, Pa. have introduced the new air-operated, semi-automatic Brinell Hardness Tester. The Air-O-Brinell is designed for application of standard Brinell loads of 500, 1000, 1500, 2000, and 3000 kg. To use the Air-O-Brinell, the operator simply adjusts the air pressure regulator valve until the desired Brinell load is indicated on the gauge. Once the load is set, any number of hardness tests can be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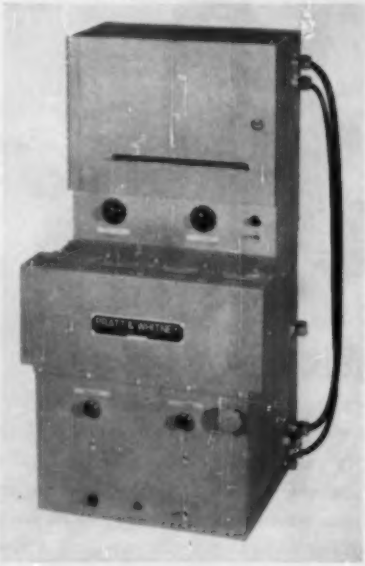
made in rapid sequence. Load is applied by pulling out the plunger-type control valve and released instantly by pushing it in. The machine need only be attached to a standard compressed air supply. Fluctuations in air supply pressure above 65 psi will not affect accuracy of the machine. The model combines the compactness and accuracy of hand operated machines with the operating ease of the more expensive motor driven models. Additional information is available from the manufacturer.

★ ★ ★

**Pratt & Whitney Co., Inc.**, West Hartford 1, Conn. have developed a production analyzing totalizer that prints a card record of the on-gage and off-gage footage of rolled strip metal produced by the rolling mill industry. The unit, operating in combination with either contacting or



non-contacting continuous strip thickness gages, prints a permanent record in numerical, rather than chart form for record keeping, for analysis and for later shearing operation. In a typical installation on a finishing mill, the unit will accumulate the undersize, on-gage, oversize, and total footages in a coil on the last pass through the strip mill. At the end of the pass, the operator inserts the standard production work card in the printer, and these footages as well as the time, the date, the coil number, the operator's number, and sets of tolerance zones, are imprinted for permanent record. During this operation the counters are automatically reset for the next coil. The card printer is actuated by a Pratt & Whitney Model D Classifying Control in conjunction with a contactor pulsed by the mill drive. Tolerance limits are easily adjustable to meet specific requirements. The card printer and totalizer unit is an accessory which may be added to both new and existing Pratt & Whitney Continuous gaging systems.

★ ★ ★

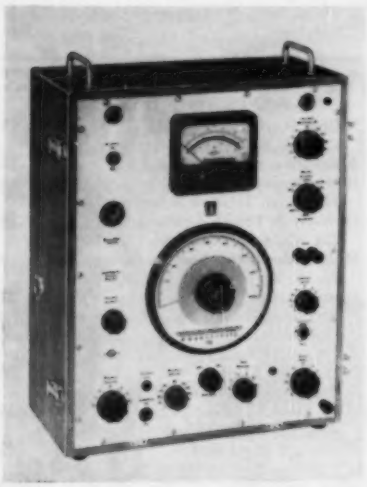
**Hastings-Raydist, Inc.**, Hampton, Va., have announced a new type of thermal conductivity measuring instrument. This instrument differs from the resistance type units widely in use for determining the thermal conductivity of gases in that it is based on the patented Hastings compensated thermopile principle, and allows more accurate measurements to be made without the instability and temperature effects of the older resistance type instruments. The Hastings Thermal Conductivity Cell incorporates six noble metal thermocouples, arranged in such a manner as to not only compensate for temperature changes in the gas, but also for rate of change of temperature effects. The instrument is for use in chemical analysis of gases and in detection of explosive gases and vapors. When used with gases of high thermal conductivity, such as helium, this instrument can be used as a tracer. The same principle used in this thermal conductivity gauge is now used in related Hastings instruments for measurement of vacuums. Hastings Vacuum Gauges based on this principle are recommended for use where an instrument with a high degree of accuracy and stability is required.

★ ★ ★

**Non-Linear Systems Inc.**, Del Mar Airport, Del Mar, Calif. have developed three new digital voltmeters especially designed for applications demanding continuous precision operation. The new instruments, models 1300, 1400, and 1500, all offer a new design concept—the use of mercury wetted contact relays. These relays assure life expectancy of more than one billion accurate readings from the new digital voltmeters. Each switch is hermetically sealed

and the platinum contact surfaces are continuously wetted with mercury by capillary connection to mercury reservoir. All adjustments are eliminated; the only motions being armature flexure. Model 1500 (5 digits) has manually-selected ranges of ± 0.000 to ± 99.999 volts d.c. with resolution of 0.001 volts, and ± 100.00 to ± 999.99 volts d.c. with resolution of 0.01 volts. The new instrument gives three complete readings per second with automatic polarity indication. Accuracy is ± 0.01 percent of value read, or plus or minus one digit. Size is 10½ inches high and 15½ inches deep for mounting in a standard 19 inch width rack. Model 1400 and model 1300 offer the same basic features as model 1500 except for four digit and three digit readout.

★ ★ ★



**Brush Electronics Co.**, 3405 Perkins Ave., Cleveland 13, Ohio are distributing a new kind of signal generator and control system manufactured by Bruel & Kjaer. The unit meets the varied requirements of a signal source for electrical, electro-acoustical and acoustical measurements. It is a beat frequency oscillator designed for a wide range of audio frequency measurements with particular emphasis on facilities for automatic frequency scanning and chart recording of data as when used with the Brush High Speed Level Recorded model BL-2304. Typical applications include all A.F. response curve measurements; high frequency vibration testing; calibration measurements; automatic sound insulation testing; acoustical measurements; and automatic distortion measurements. Frequency range is from 20-20,000 cps and can be swept continuously either manually or by means of an external drive. Remote

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Ellstrom Standards are furnished in 28 basic sets of from 8 to 92 blocks in both rectangular and square styles. Individual blocks are also available in sizes ranging from .010" to and including 20.000" to meet your particular needs. Send for complete specifications and prices today!

Set No. 35-R: "W"—$185.00; "I"—$280.50

Set No. 81-SA: "W"—$545.00; "I"—$764.25

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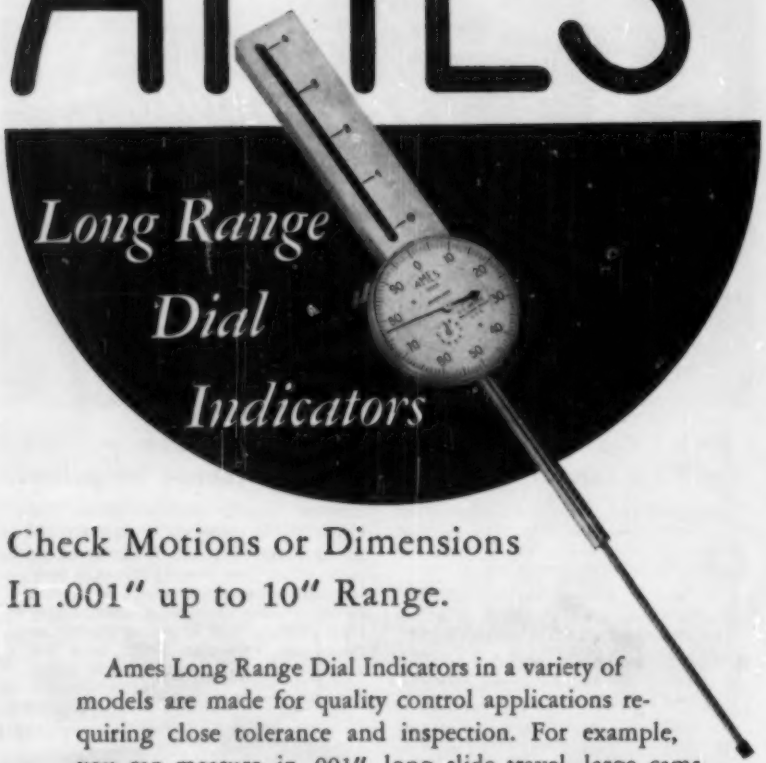
# AMES

*Long Range Dial Indicators*

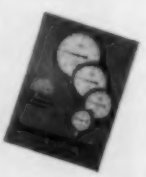


## Check Motions or Dimensions In .001" up to 10" Range.

Ames Long Range Dial Indicators in a variety of models are made for quality control applications requiring close tolerance and inspection. For example, you can measure in .001", long slide travel, large cams, deep recesses or other dimensions requiring indicator spindle travel of up to 10".

In addition, Ames Long Range models have all the advantages that are built into Ames regular indicators:— dials of large diameter; easy-to-read, widely spaced graduations; movable dials; replaceable contacts. All Ames Long Range indicators have count hands to indicate revolutions of the indicator hand. Those with box covered, rack guide have a slot in the cover graduated to register each inch of spindle movement.

Write today, sending your problem in long range measuring. Ames will be glad to suggest a solution. Be sure to include drawings and specifications – your answer will be back faster if you do.



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control facilities, an output control system to prevent external signal feed back and automatic frequency markers are available.

★ ★ ★

### NEW LITERATURE

A detailed listing and description of its complete line of spectroscopic electrodes and powders is presented in a new 16-page catalog available from National Carbon Company, 30 East 42nd St., New York 17, N. Y.

Simpson Electric Co., 5200 West Kinzie St., Chicago 44, Ill., have issued a new bulletin illustrating and describing their electronics testing equipment. Another new Technical Manual describes the complete line of electrical indicating instruments and test equipment manufactured by this company.

Panoramic Radio Products, Inc., 9 South Second Ave., Mount Vernon, N. Y., have published a bulletin describing the Panoramic Sonic Analyz-

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You can have 100% inspection of production of nearly any possible coating on almost any base. The first and only non-destructive tester which gives fast, accurate, direct readings of such combinations as silver on brass, copper on zinc, metallizing on plastics, paint on metals—without the use of chemicals.

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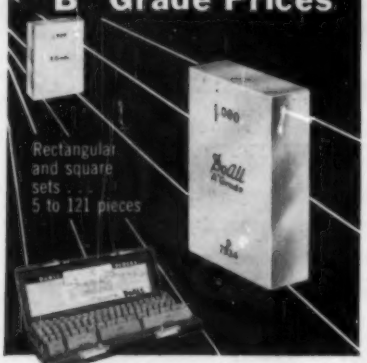


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Infrared Spectrophotometry in the Pharmaceutical Field highlights the latest edition of the Beckman Infrared Notes, a quarterly publication written for infrared spectroscopists. It is available from the Beckman Division, Beckman Instruments, Inc., Fullerton, Calif.

Freeze-Drying Equipment for Laboratories is the subject of a new 36-page catalog just published by Arthur S. LaPine & Co., 6001 South Knox Ave., Chicago 29, Ill. The catalog includes a description of new freeze-drying units, vacuum gauges and pumps, bath coolers, refrigerated centrifuges, and related laboratory and small scale production equipment.

## POSITIONS AVAILABLE

*Address all replies to box number references to: American Society for Quality Control, Room 6197 Plankinton Bldg., 161 W. Wisconsin Ave., Milwaukee, Wis.*

Engineering graduates with imagination for large variety of Quality Control assignments related to the control industry. Will design electro-mechanical testing equipment and procedures, assist in development of new products and trouble shoot production line. Extremely diversified nature of work makes qualified applicants good candidates for steady advancement.

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QUALITY CONTROL ENGINEER

With knowledge of gage design, trouble shooting and inspection methods used in mass production. Experience in statistical quality control desirable. Salary $7,000 to $8,000. Ronson Corp. of Pa., 250 Harris St., East Stroudsburg, Pa.

Paper manufacturer with multi-plan operation has opening for recent engineering graduate in its staff quality control organization. It is desirable that this man have quality control or statistical training. More important, however, is that this man be a self-starter with initiative and ability to work with others. Location: Western Massachusetts. Please reply to Personnel Dept., Peter J. Schweitzer, Inc., Lee, Mass.

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QUALITY CONTROL MANAGER age 42. Presently connected with firm having the distinction of being the oldest

*(Continued on page 40)*


# QUALITY CONTROL ENGINEER

A fully integrated quality control program is being planned for a new sanitary ware ceramic plant being built at Plainfield, Conn. This man will plan all inspection procedures, tests and experiments for defect prevention, quality assurance procedures, the application of statistical tests, and the planning of executive reports on quality. Preliminary training will be given at our plant in New Orleans, Louisiana.

Applicants must have had engineering training or equivalent experience in the field of modern industrial quality control. Kindly furnish resume of personal data and experience, including snapshot if available. Address replies to Personnel Administrator, American-Standard, P. O. Box 149, Danielson, Conn.

# QUALITY CONTROL ENGINEERS

A new fully integrated quality control program is being set up at Unit Plant which is manufacturing chrome plated brass plumbing fittings. Under the direction of the Quality Control Engineering Supervision these Engineers will plan all inspection procedures, tests and experiments for defect prevention, quality assurance procedures (audit and check inspection), the application of statistical tests, and the planning of executive reports on quality. Applicants must have had engineering training or equivalent experience in the field of modern industrial quality control. Kindly furnish resume of personal data and experience, including snapshot if available. Address replies to Personnel Administrator, American-Standard, 1541 South Seventh Street, Louisville 8, Kentucky.

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Graduate Engineers for standards development in radiography, ultra-sonics, and other non-destructive testing techniques.

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